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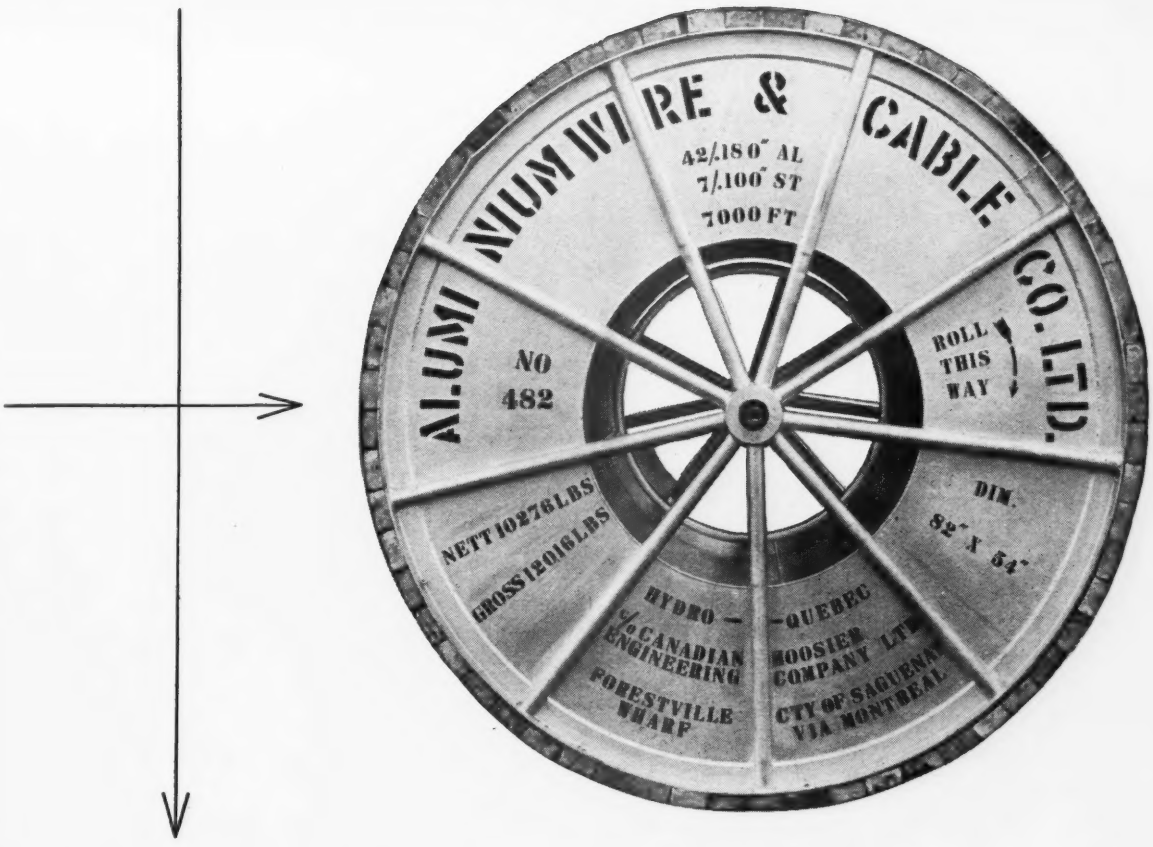

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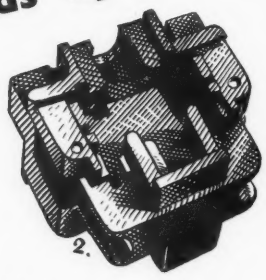

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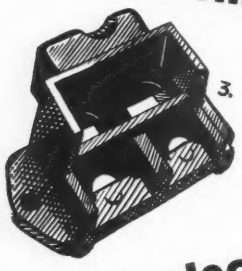

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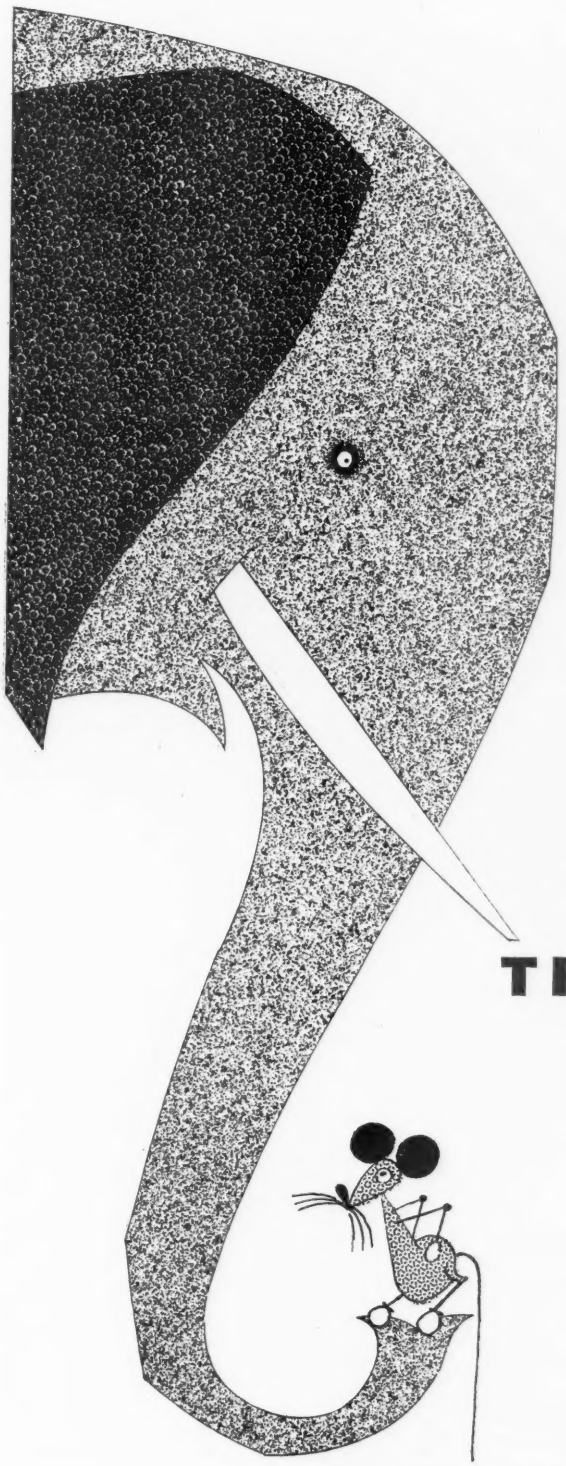

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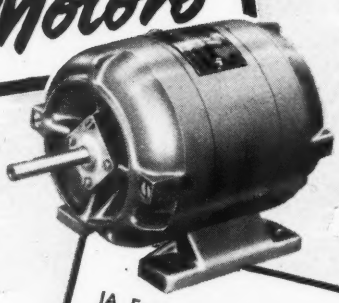

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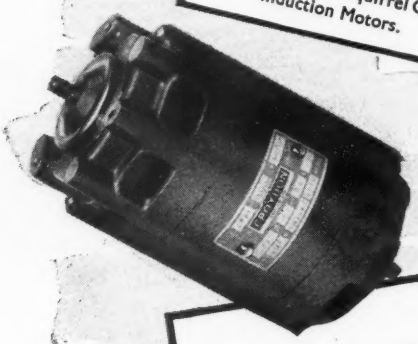

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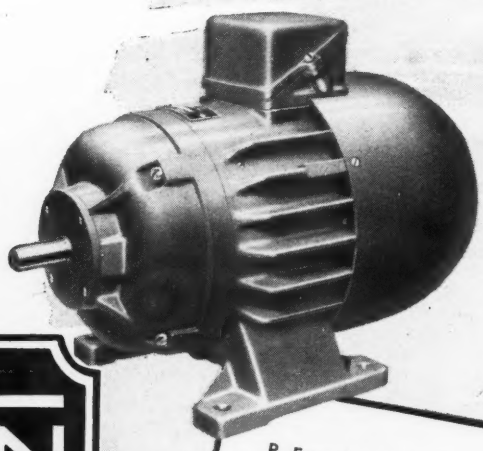

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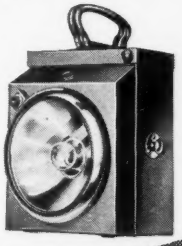

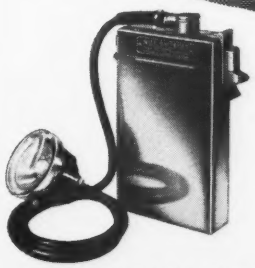

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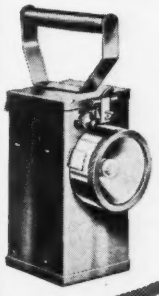

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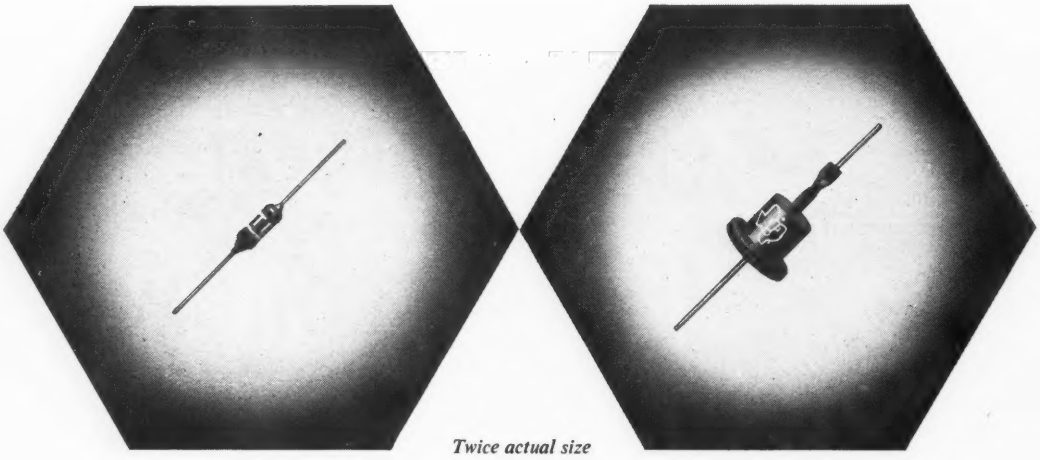

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SPECIFICATIONS	Max. Reverse Current at P.I.V. 25°C			0.2	10.0		μA
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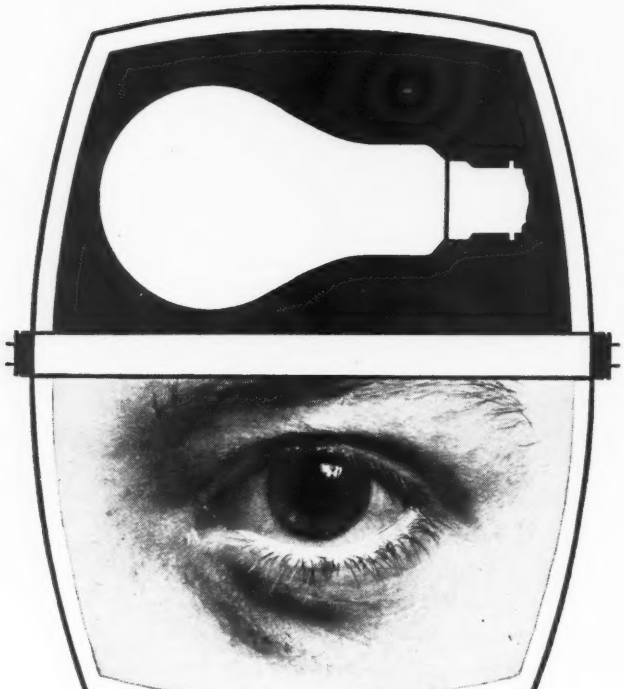

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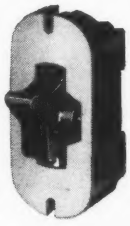
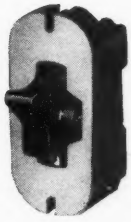


15 amp one-way single pole switch
List No. 4761



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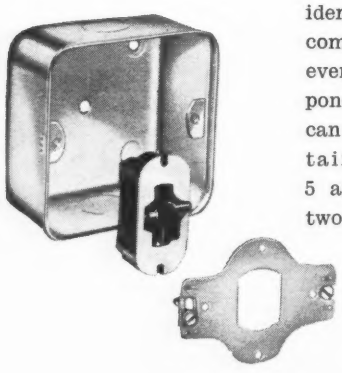

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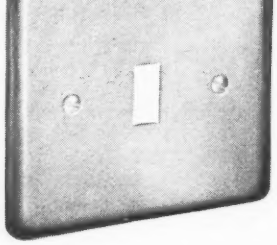

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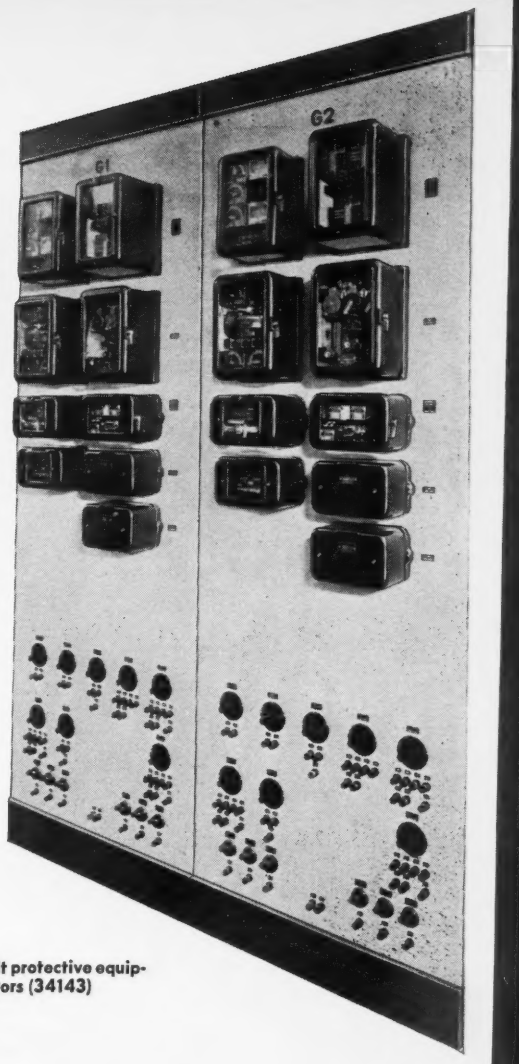

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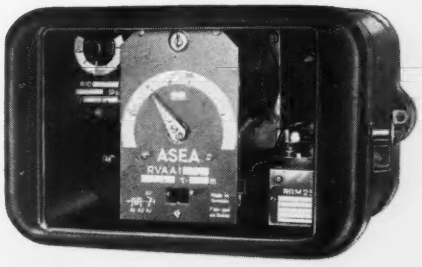

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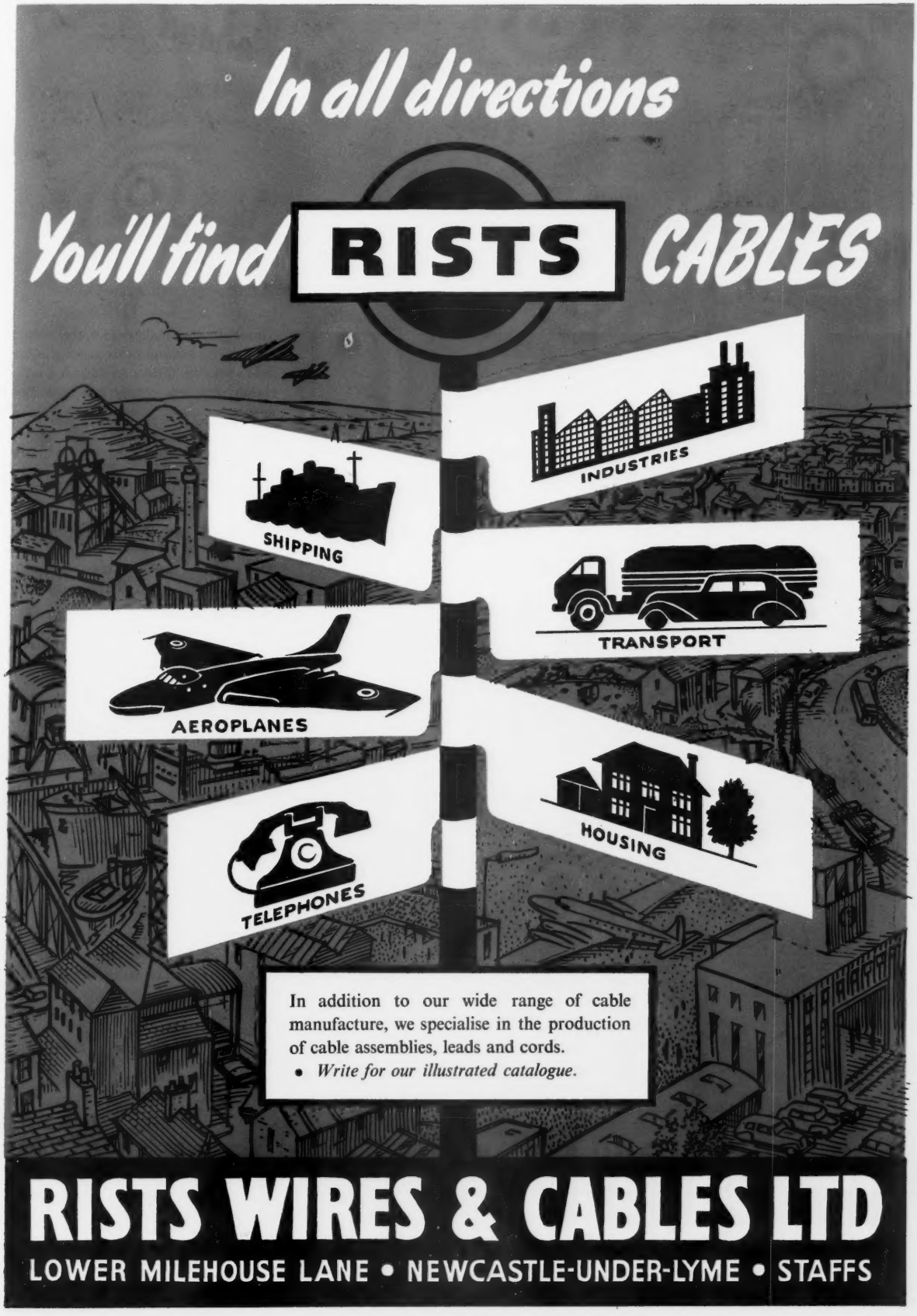
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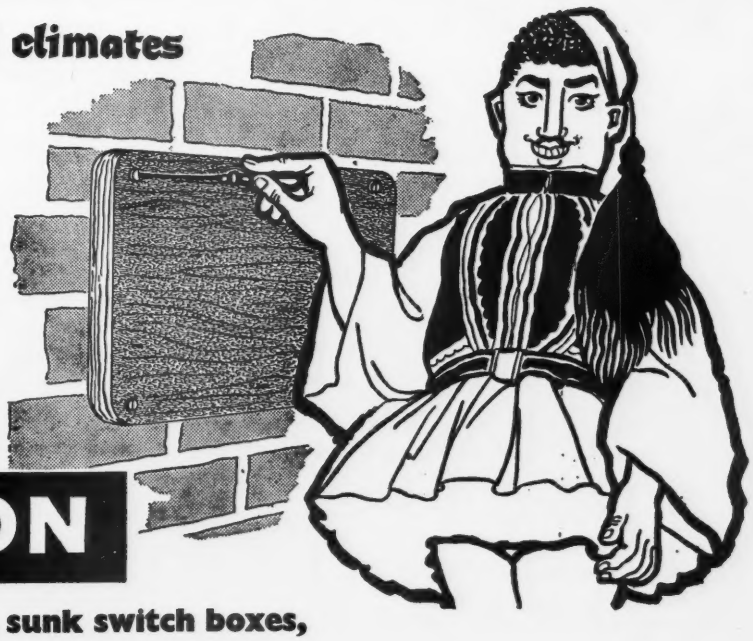

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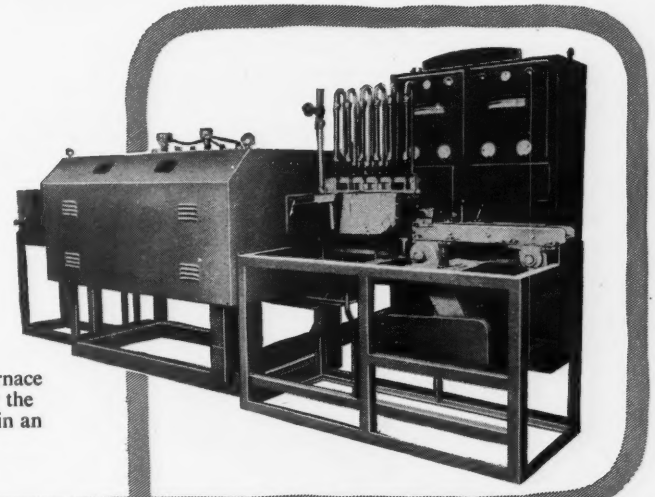

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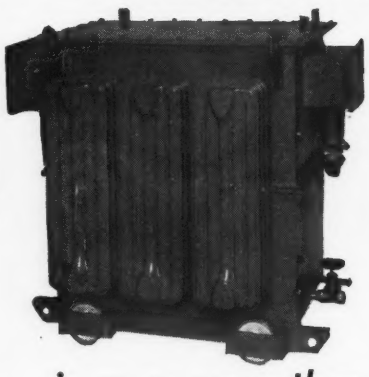

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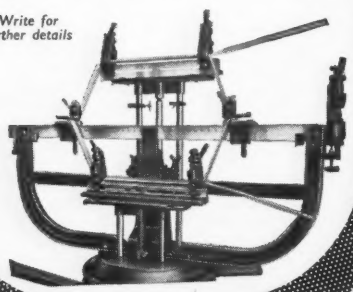

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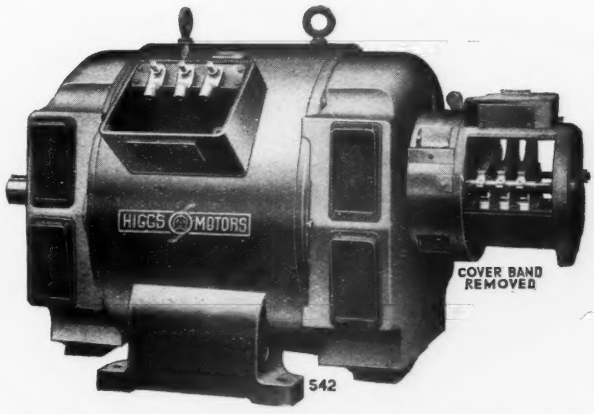

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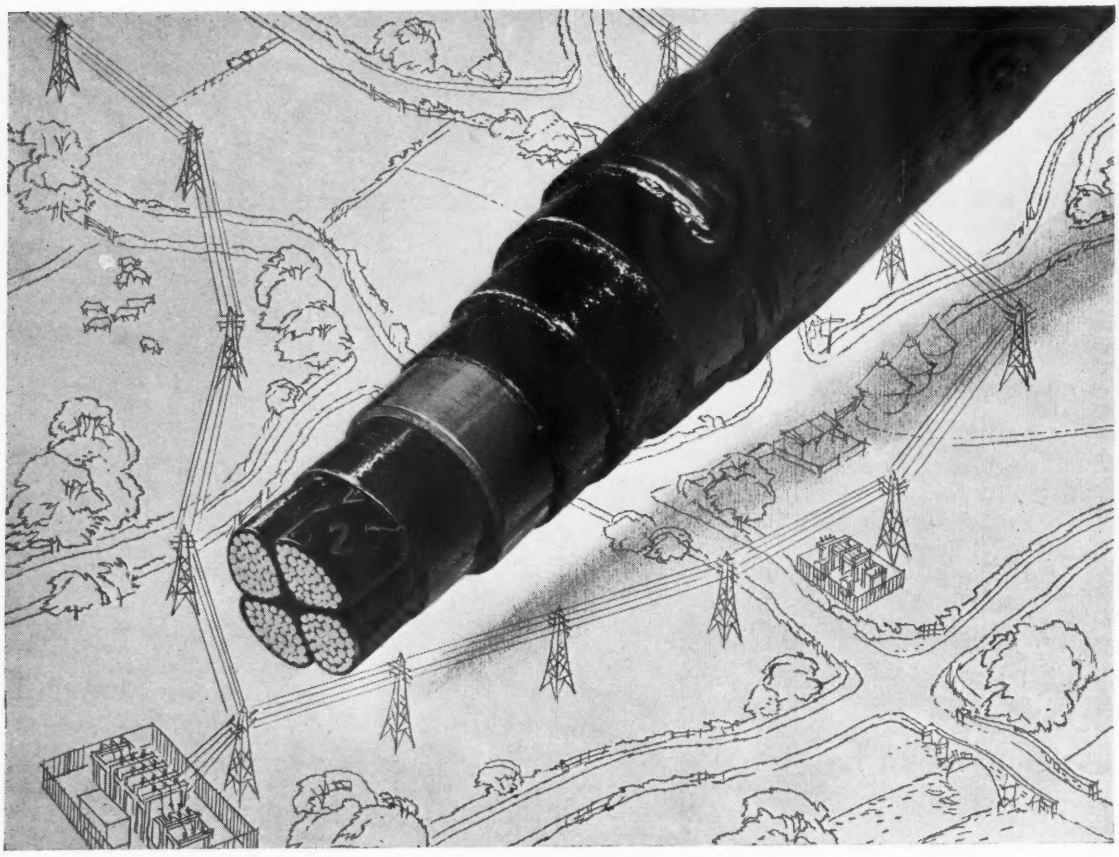

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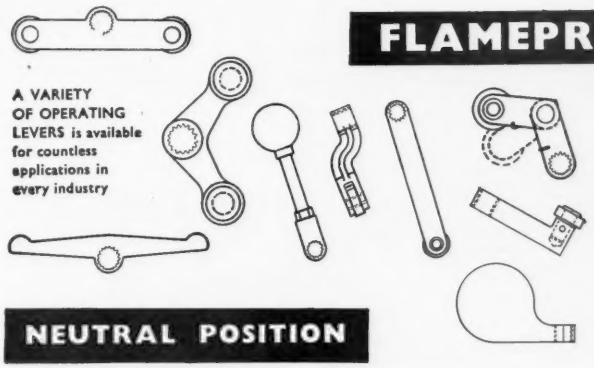

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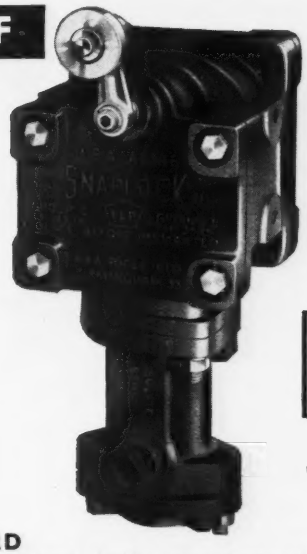

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Single pole, double break, double throw, operates with either circuit normally open with other closed, or maintaining in either position, or available with central neutral position: return springs removable for various circuit arrangements. Heavy die-cast case. Water, oil and dust proof. Conduit ¾" in. B.S., or No. 3 Admiralty Pattern Cable gland entry. Two screw side mounting or backplate mounting in two styles, or Tandem style (back to back mounting). Operating lever position adjustable in 7·5 deg. increments through 82.5 deg. either way from normal. Levers for a variety of applications.

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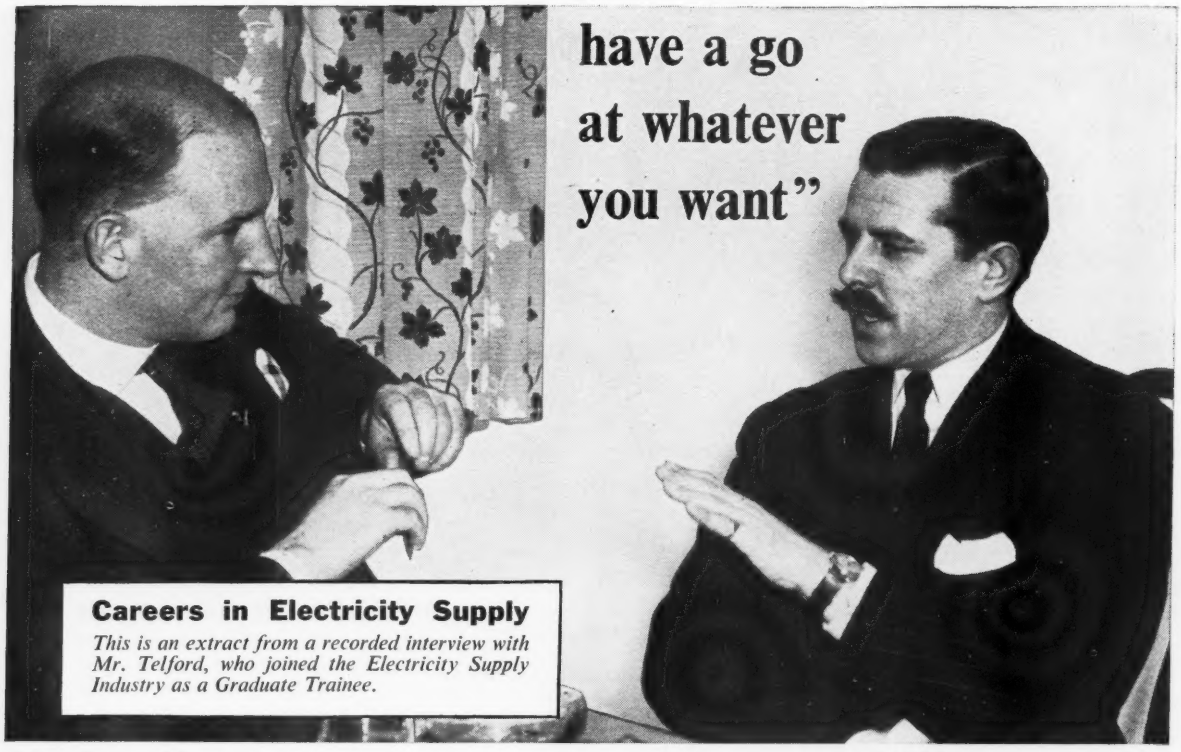
Buxton certificates No. 3574 (Group I) No. 3575 (Groups II and III gases). Meehanite iron castings. Self wiping solid silver contacts. Interchangeable plugs and sockets. Internal mechanism removable as a unit for servicing. **Single SWA cable entry (standard); double entry if required.** Operating lever position adjustable in 7.5 deg. increments through 360 deg. Levers for a variety of applications. **TYPE HLB:** Single pole, double break, having one normally closed and one normally open circuit — reversible by transferring the return spring. Return spring removable for external manual operation. **TYPE HLB/NP:** Single pole, double break, double throw, with central neutral position. Return springs removable for various circuit arrangements.

"...you can have a go at whatever you want"



Careers in Electricity Supply

This is an extract from a recorded interview with Mr. Telford, who joined the Electricity Supply Industry as a Graduate Trainee.

C.E.A. Question Master — *Mr. Telford.*

Question Master: **I think we might begin by asking what was your first job in Electricity Supply after your training was finished ?**

Mr. Telford: Well, my training was interrupted by the war, and it was only in 1950 that I finished my graduate course in the industry. I was then appointed Shift Charge Engineer at Frome, Somerset—a small station but an excellent training ground. From there I went to Earley—a much bigger station of 120 megawatts—as Boiler House Shift Engineer; later I became Charge Engineer there, and for a while was Efficiency Engineer, as well.

Q.M.: **Your next step was London, wasn't it ?**

Telf: Yes, I came to London as Second Assistant Engineer on the Divisional Staff, and later I was appointed Deputy Superintendent at Bankside Generating Station—the position which I hold now.

Q.M.: **Bankside is a pretty big station, and at 36 you're young, aren't you, to be a Deputy Superintendent ? But what made you come to London in the first place ?**

Telf: A chance came along to get some administrative experience at H.Q. level, and I thought I'd better take it.

Q.M.: **Does the Industry give many opportunities like that ?**

Telf: It most certainly does. It gives you a complete opportunity to have a go at whatever you want, and what you think you're best equipped for. The man who wants to get on is helped in every possible way; I've attended several courses run by the Authority, not only on technical matters, but on subjects like personnel selection and industrial relations.

Q.M.: **You find your job gives you scope for managerial ability—dealing with people as well as machines?**

Telf: Yes, indeed. I don't think there are many better opportunities than in a power station, because you have something of everything. You have the mechanical side, the electrical side, the building side—and most of all, a number of people with varied interests and jobs.

Q.M.: **Now a word about newcomers to the industry. If you have a chap of ability who is prepared to get down to the task, what would you say his opportunities were like?**

Telf: I would say that he has really splendid opportunities. For one thing, a career in the industry is established on a very firm footing—you could do without a lot of things, but it's impossible to get on nowadays without electrical energy. Another point worth remembering is that a man coming into the industry has the choice of the entire country to work in—England, Scotland and Wales—and there's no parochial approach.

We'd like to publish more of this interview, but there isn't space. For full details of the many careers in Electricity and the salaried training schemes available, please write to:

The Education and Training Officer, Central Electricity Authority, 12 Winsley Street, London, W.1.

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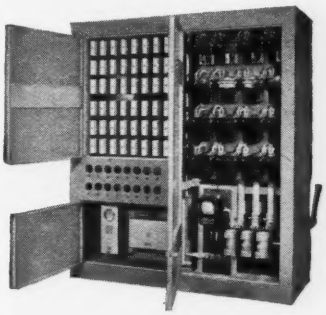

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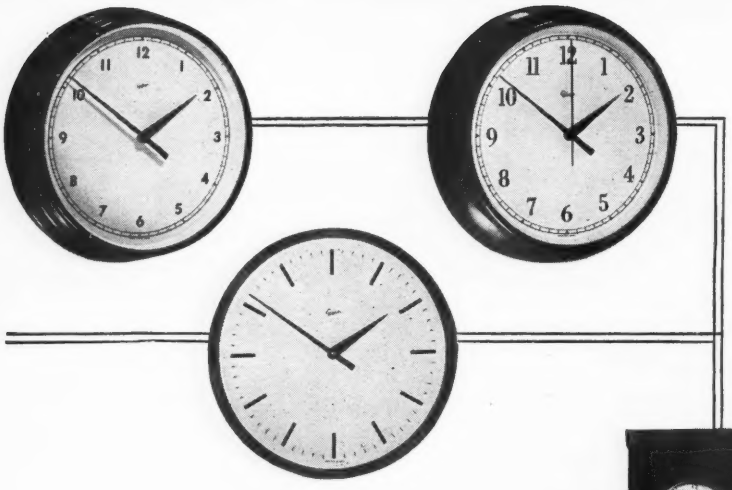

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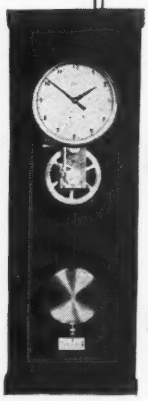

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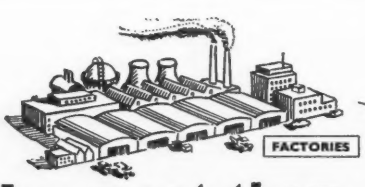
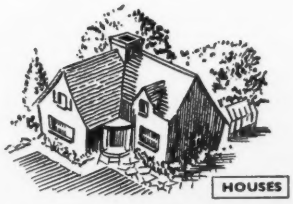
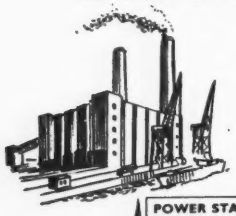




You meet them everywhere...



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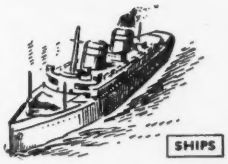

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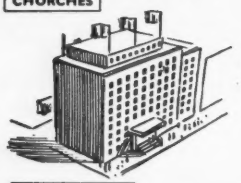

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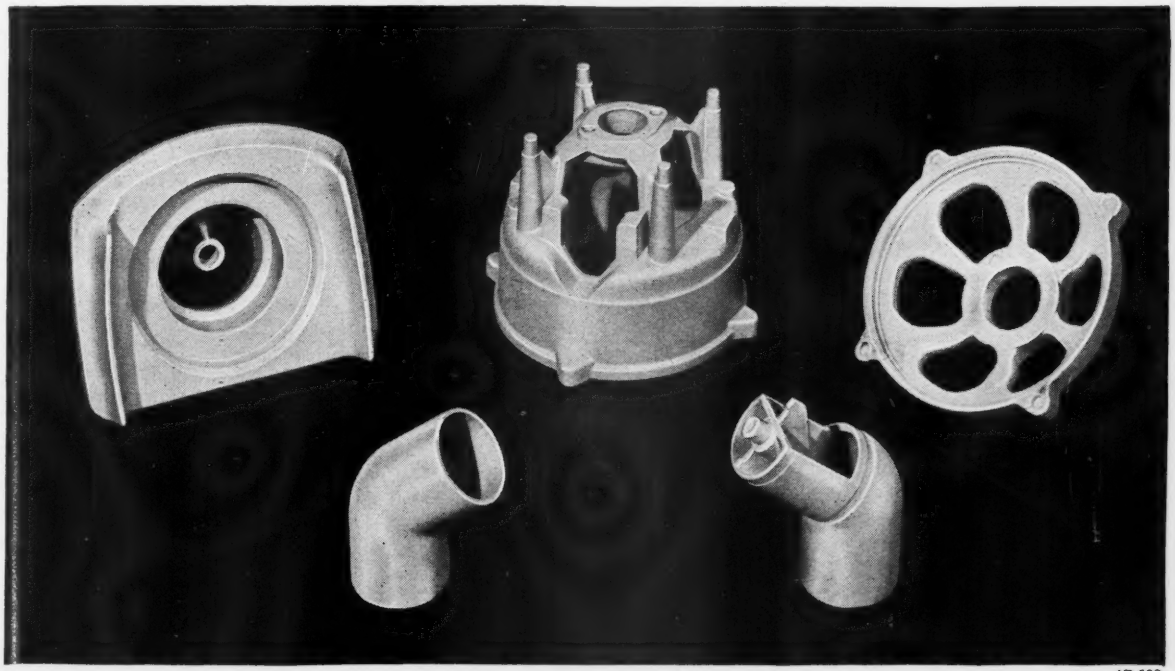

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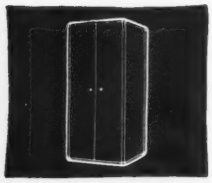

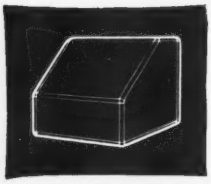

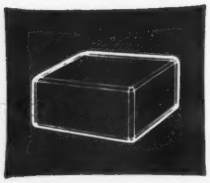

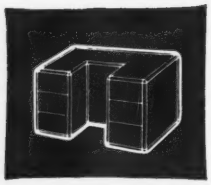

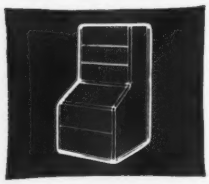

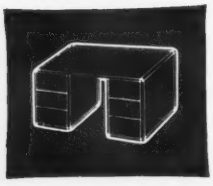

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Using general duty components, i.e., IE/1001 90° Casting, IE/2024 90° strengthened Extrusion, IE/1004 Spacer Bar Casting, IE/2008 Spacer Bar Extrusion and IE/1009 Cruciform Junction, the material's cost for the framework only is just under £20.

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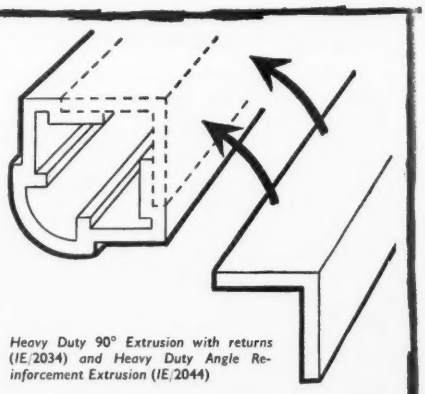
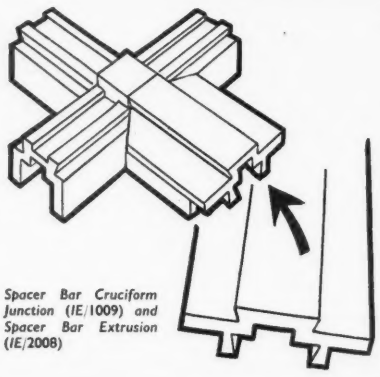
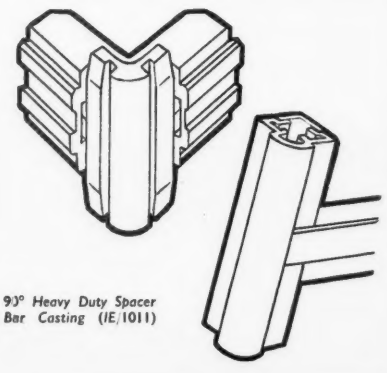


Heavy Duty 90° Extrusion with returns (IE/2034) and Heavy Duty Angle Reinforcement Extrusion (IE/2044)



Spacer Bar Cruciform Junction (IE/1009) and Spacer Bar Extrusion (IE/2008)



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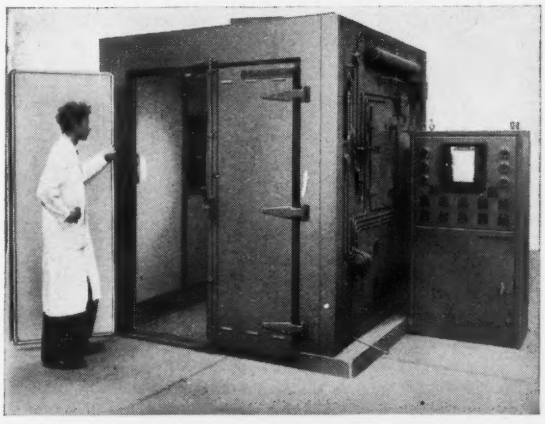
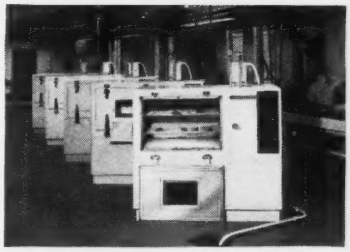


A complete range of standard types and sizes is available for testing components or complete assemblies to all specifications.

A typical "B-W" Tropical Chamber for testing large assemblies is seen on left.



Group of small "B-W" Testing Cabinets for components and sub-assemblies is illustrated above (photo by courtesy of Nash & Thompson Ltd., Chessington, Surrey).

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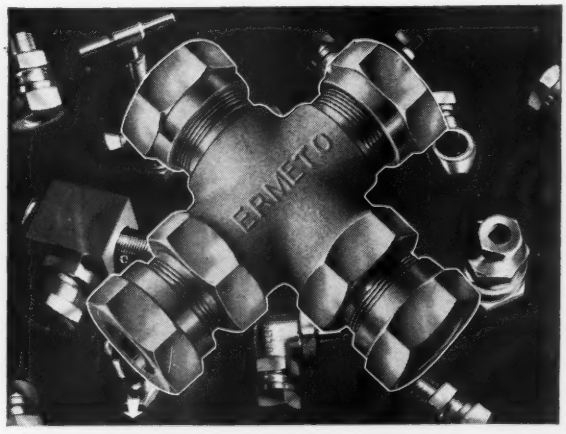

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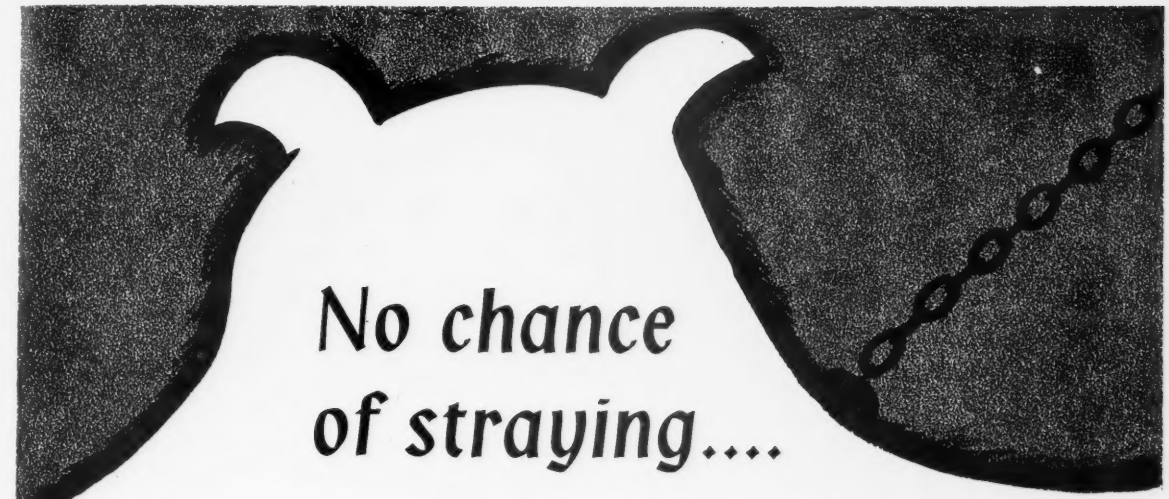

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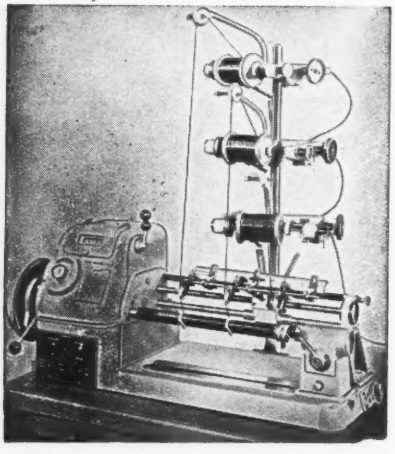

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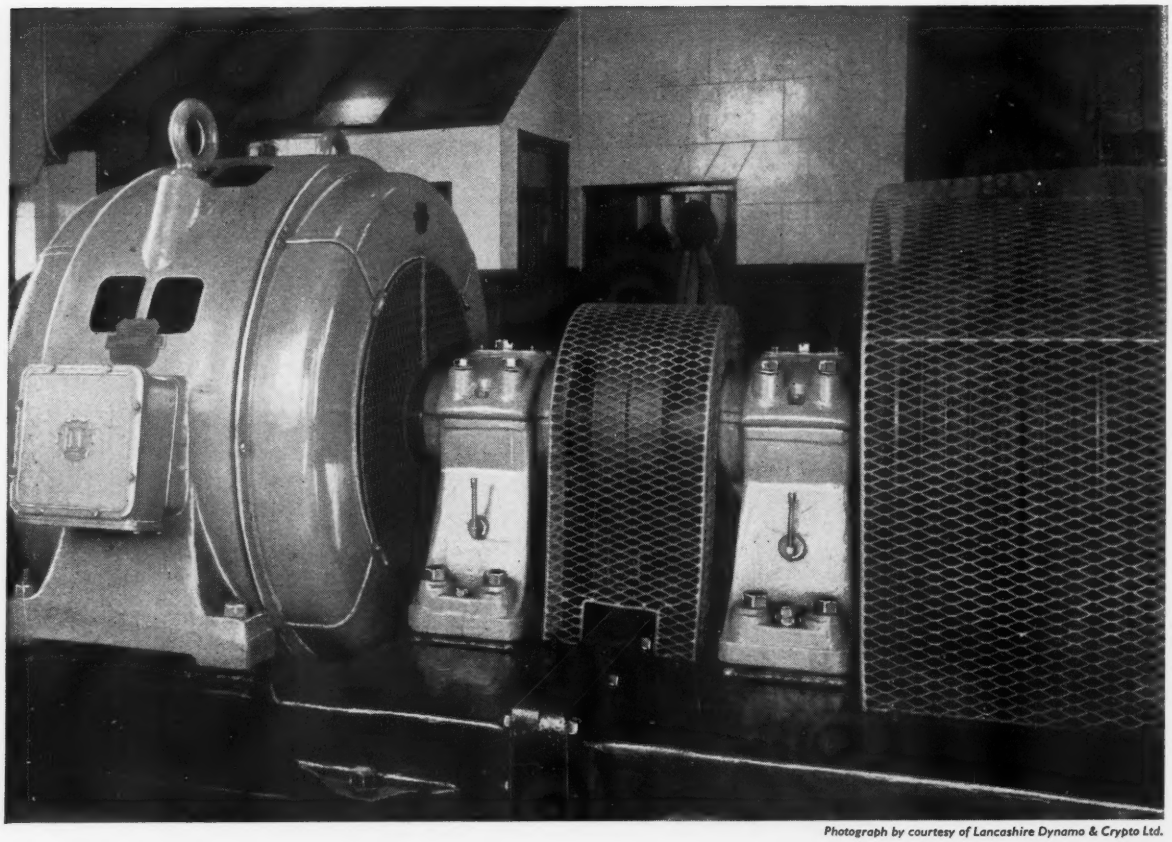

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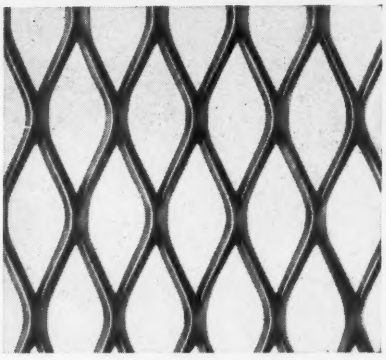

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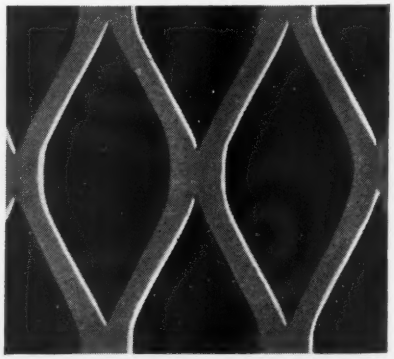

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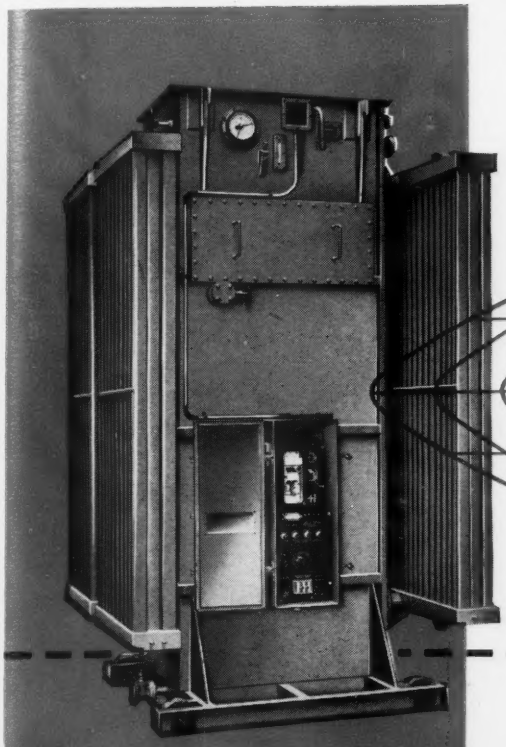

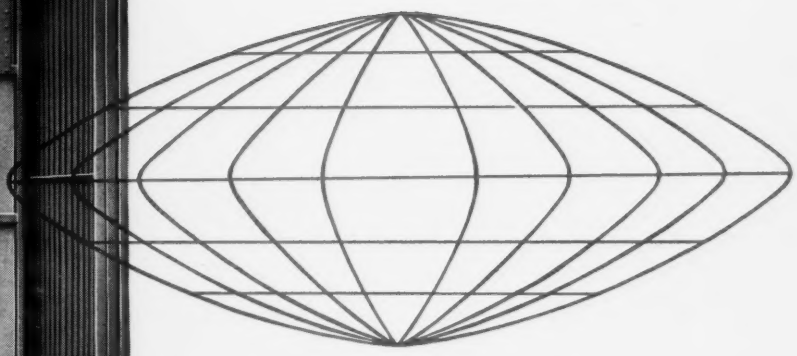

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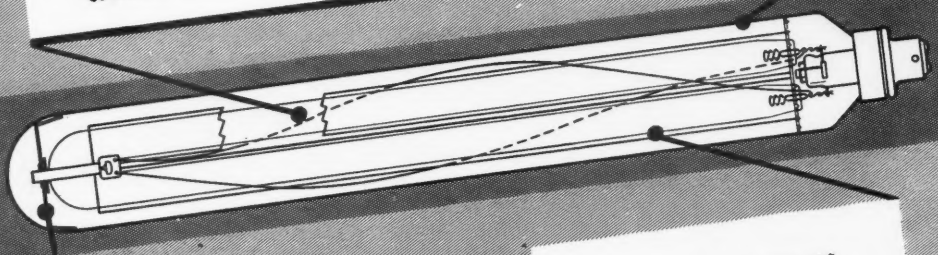

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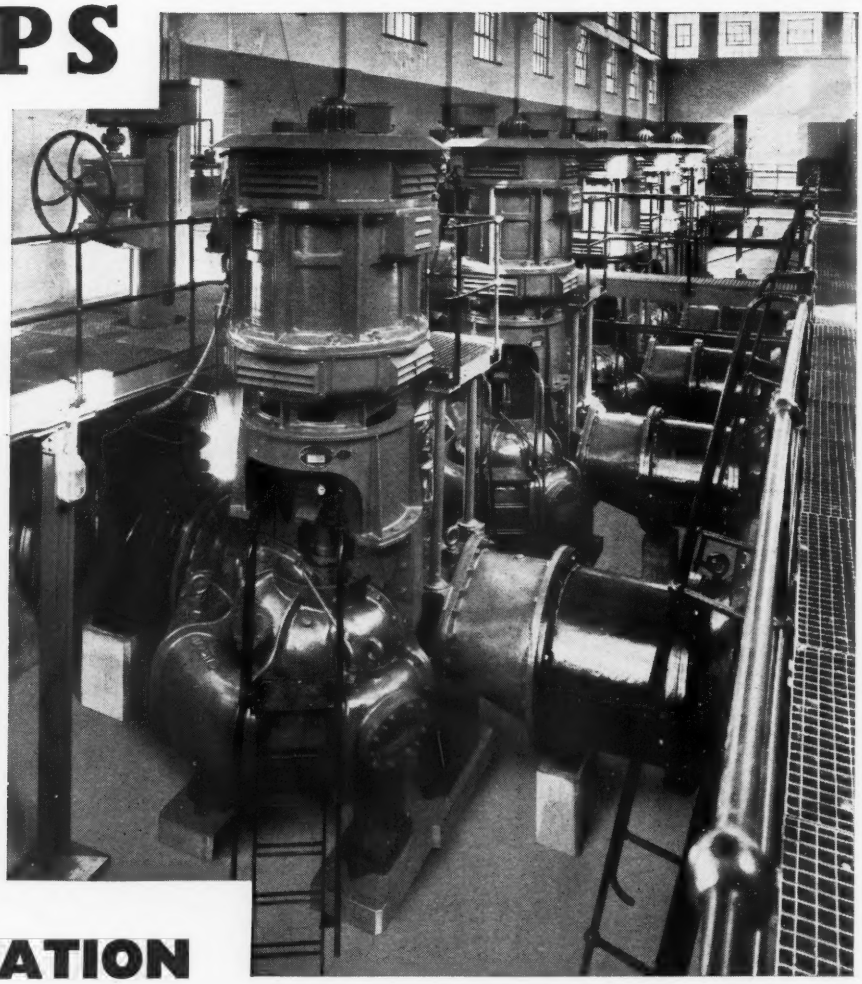

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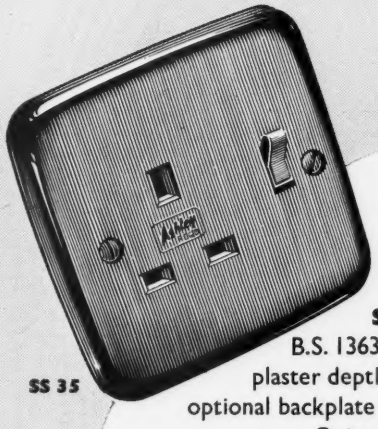

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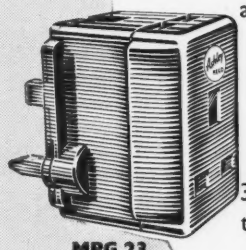

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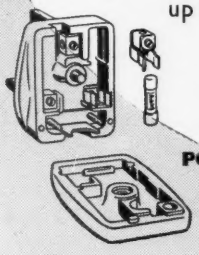

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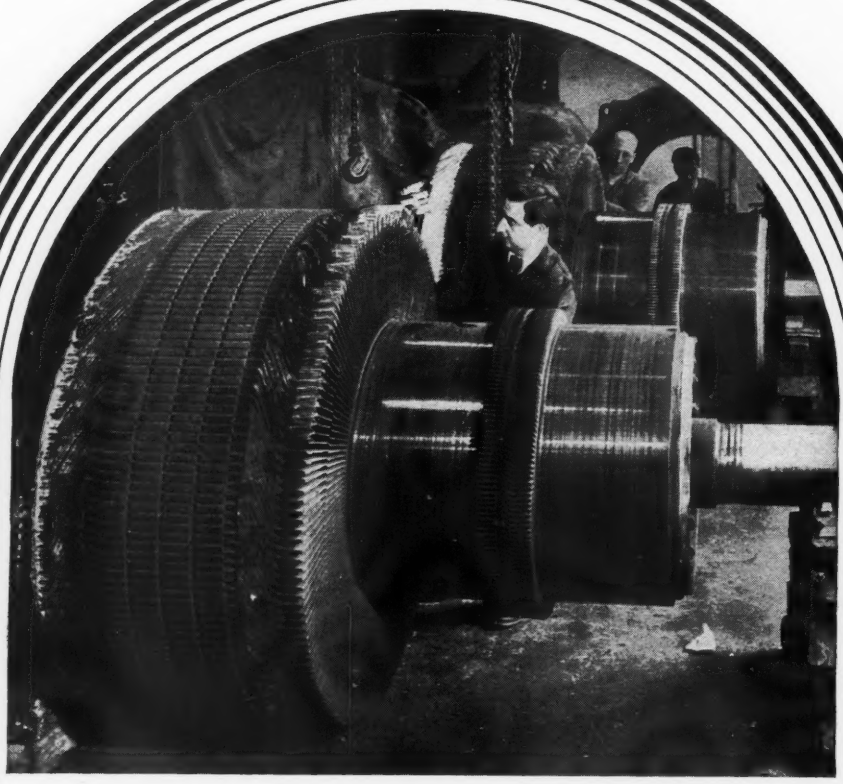

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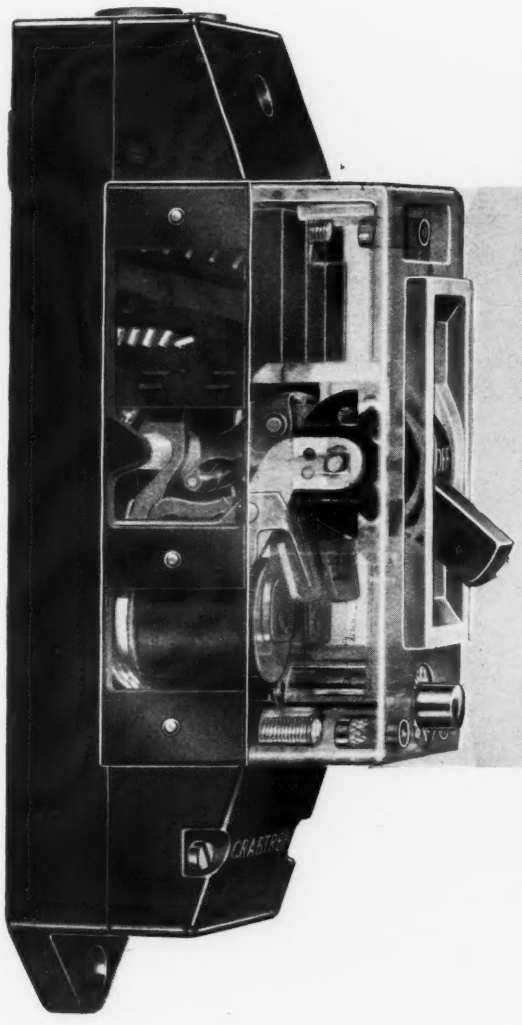

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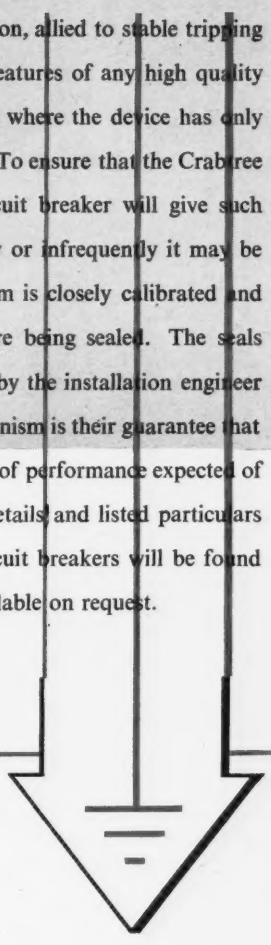

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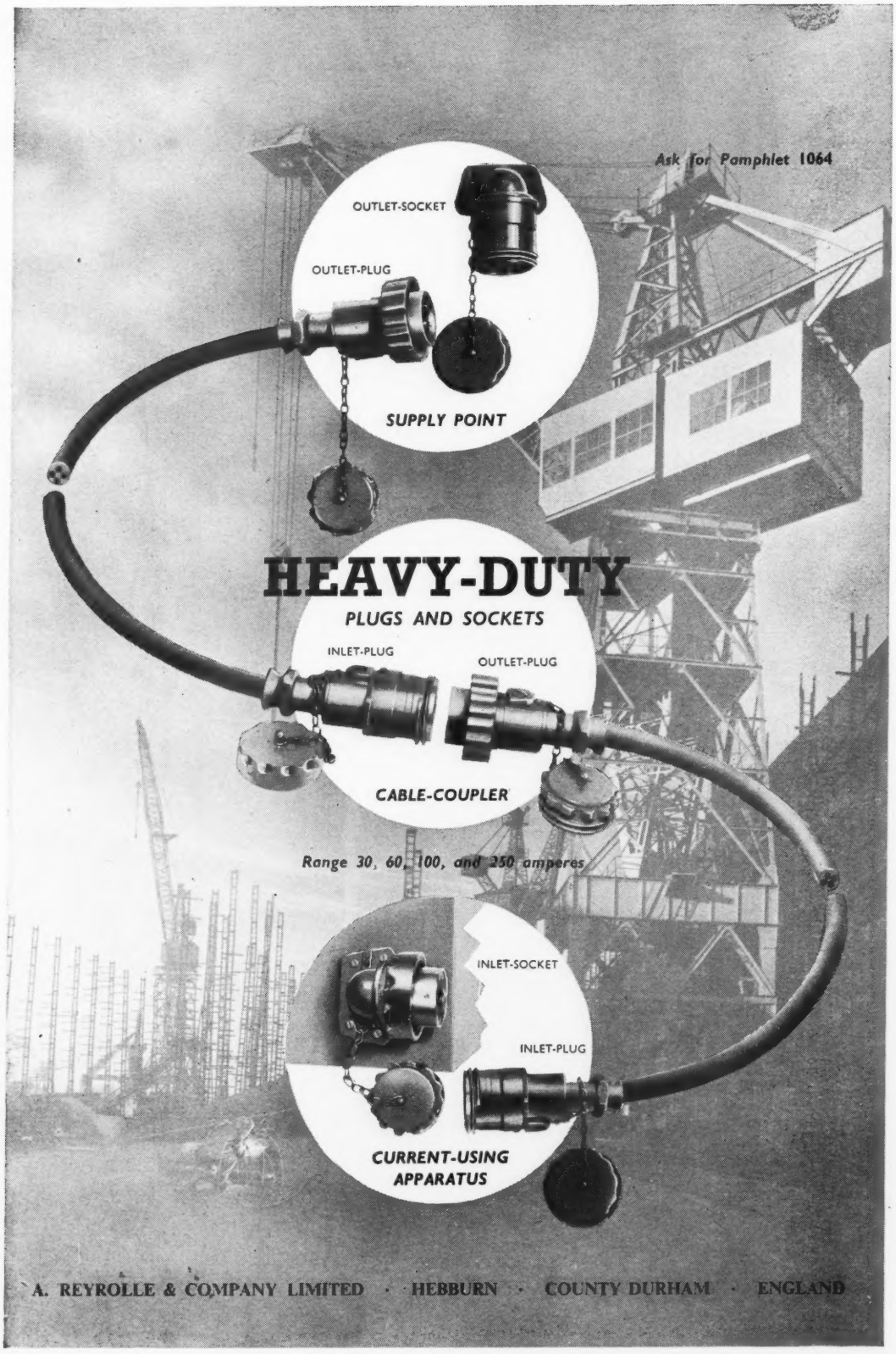
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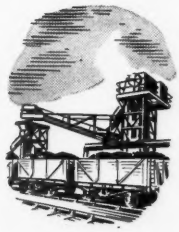

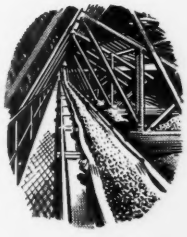

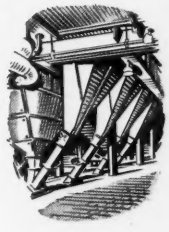

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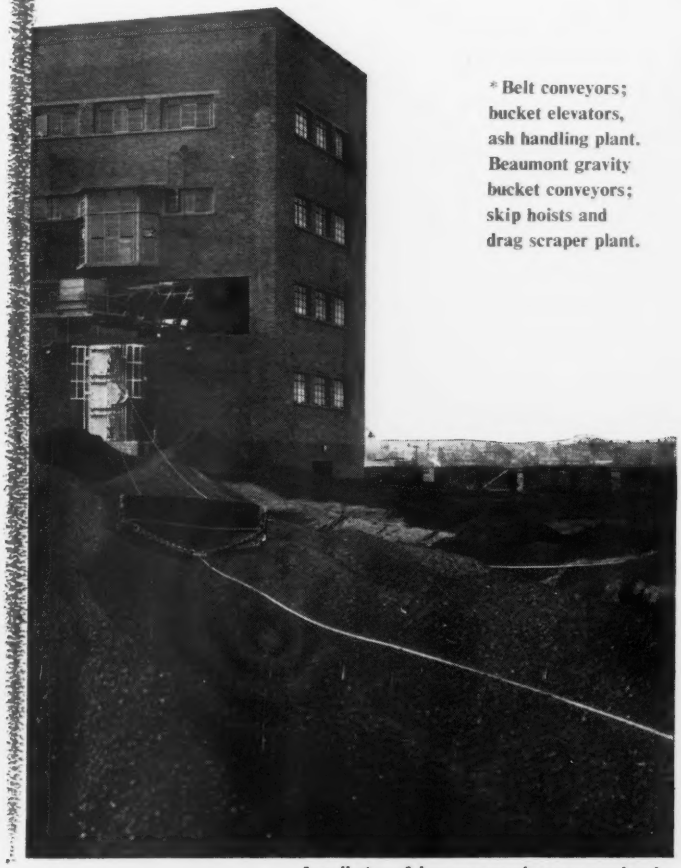

Installation of drag scraper plant at a steelworks.

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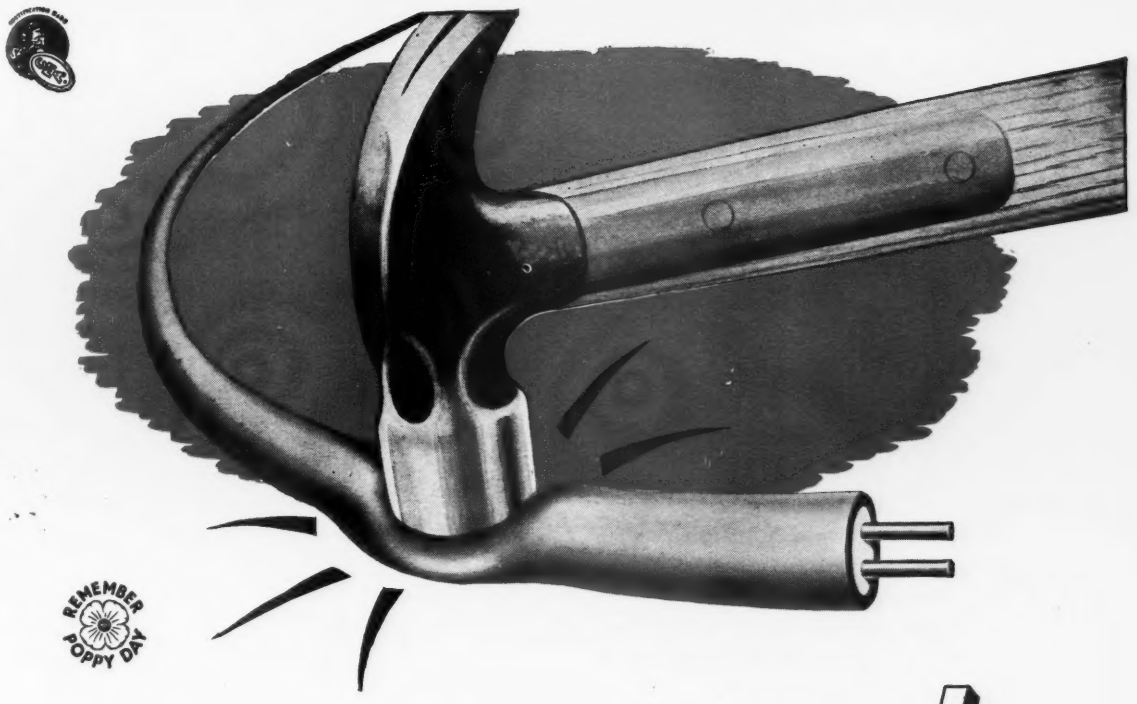

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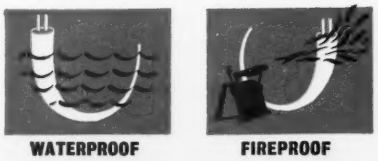

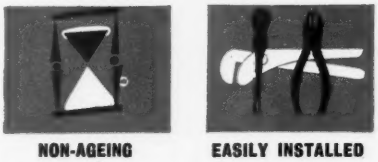

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New manufacturing techniques developed by the Company ensure accurate control of cable size, result in fully annealed copper conductors and enable a consistently high manufacturing standard to be maintained.

BICC M.I. Cables are available for immediate delivery in 440V and 660V grades with one, two, three, four or seven conductors. Full details, specifications and jointing instructions are available on request.

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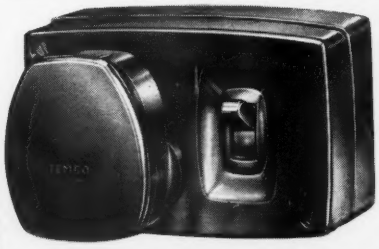
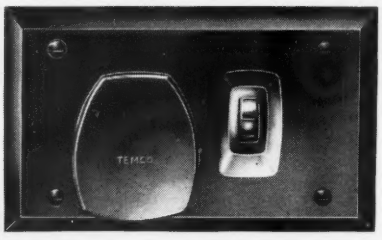
These Accessories are also available in cream. Please write for catalogue showing complete range.



CAT. NO 4005 BROWN



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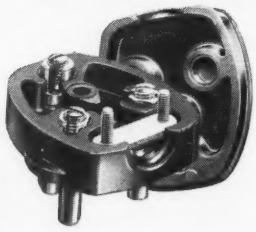

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are the modern method

PRECISION MADE INTERLOCKING
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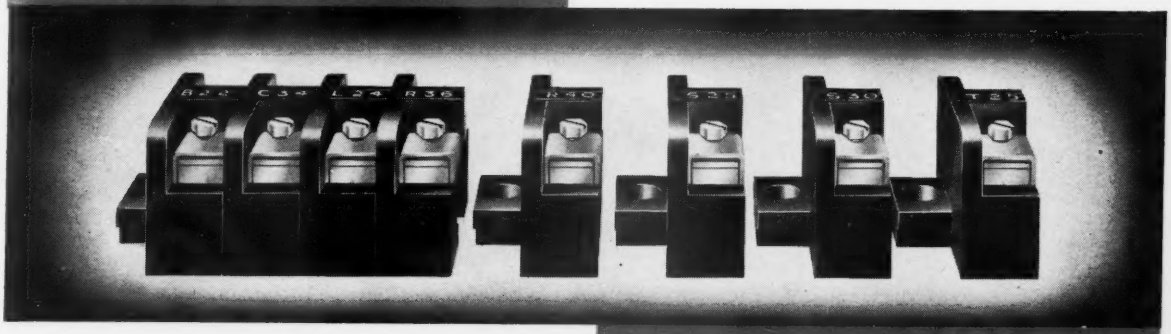

RATINGS

Size	Rating	Terminal Screw Size	Panel Fixing Screws	Supplied in Standard Packs of:
0	10 amp	4BA	4BA	12
1	30 amp	4BA	2BA	12
2	75 amp	¼" UNIF.	2BA	6

CLAMP TYPE TERMINALS: Self-enclosing and giving complete protection to all conductor strands —

NO SOLDERED ENDS or special terminal tags required.

PANEL MOUNTING: Terminal Assemblies consisting of any number of Multi-Lock Terminal Blocks can be built up and mounted on any flat surface.

IDENTIFICATION LABELS can be inserted into slots provided in mouldings.

ELECTRICAL CLEARANCES to B.S.I. and C.S.A. specifications.

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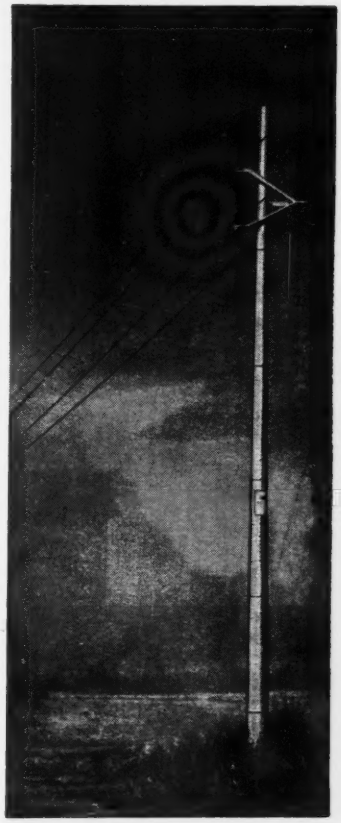
Transport problems for man were solved by the evolution of the wheel.

To-day the transportation of *Adastra* steel poles presents no difficulties. All pole sections are nested for despatch, an arrangement that enables them to be transported by land, sea or air with the utmost facility.



Adastra products include :— Sectional tubular metallic poles for overhead electric power lines, and telecommunication lines. Street lighting columns, floodlighting structures, radio masts, flagpoles, sign supports, etc. Specialists in quantity production of welded metal cylinders.

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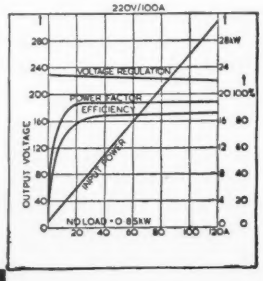
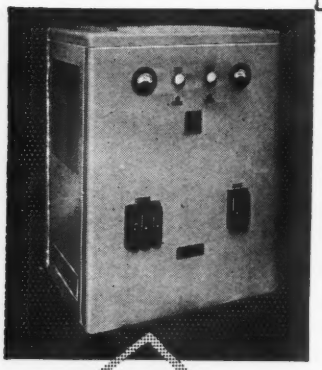
500W to 75kW all with single anode mercury vapour bulbs

All rectifiers in Philips wide range are noted for :—

- ★ **High efficiency and long life with single anode mercury vapour bulbs;**
- ★ **low initial cost;**
- ★ **reliable service with minimum attention, due to absence of moving parts.**

Rectifiers can be constructed to individual requirements or to fit into existing site conditions. If you would like our technicians to visit your premises and advise you without obligation, or if you require further details of our range of rectifiers, please write to address below.





General characteristics of a typical Philips Rectifier can be seen from the graph above, showing a rectifier designed to operate from 3-phase supply and giving up to 100 amps at 220/230 volts DC.
The curves indicate:

(*a*) Excellent voltage regulation obtained from light load up to overload.
(*b*) Maintenance of high efficiency even at partial load.
(*c*) Small ' no load ' loss.
(*d*) High power factor, well maintained at partial loads.

Research and Control Instruments Division

PHILIPS ELECTRICAL LTD

INDUSTRIAL PRODUCTS DIVISION

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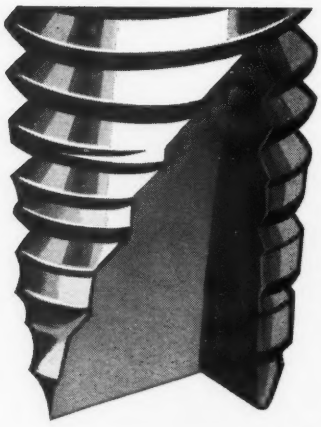

WHY A SLOTTED SHANK?

The slot exposes a sharp, serrated cutting edge, enabling 'Shakeproof' screws to cut their own thread with a true tapping action. Assembly costs are reduced because of the elimination of a separate tapping operation, and the self-cut threads mate accurately to ensure a vibration resisting fit. 'Shakeproof' thread cutting screws are available for use in hard metals, ordinary metals and plastics. They give greater efficiency, with savings in time and cost.

A.I.D. APPROVED

"SHAKEPROOF"

REG. TRADE MARK Nos. B611535

THREAD CUTTING SCREWS

British Patents Nos. 386895 · 551478

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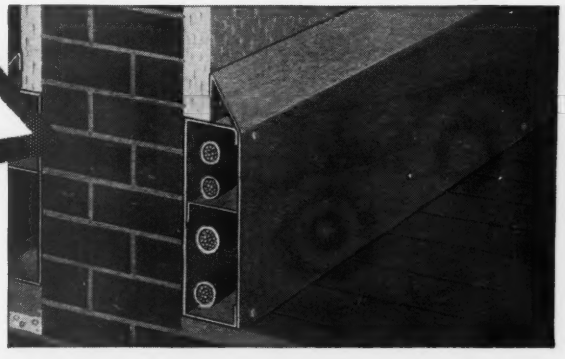
Wordrew Ltd., 173 Princess Street, Manchester 1.

SB3

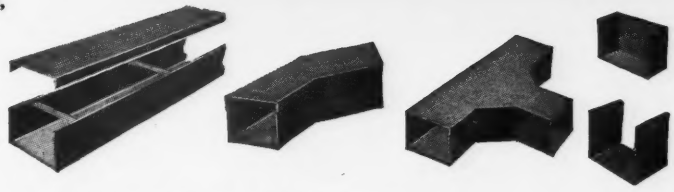
INSTALL CABLES EFFICIENTLY AND SPEEDILY with BRABY CABLE ACCESSORIES

BRABY perforated Cable Plates and Bends ensure speedy, simplified fixing OR removal of Cables. The plates and bends can be supplied in mild steel—self colour, painted, galvanized after manufacture or plastic coated. Also supplied in aluminium alloy.

BRABY mild steel Trunking protects and conceals cables.



BRABY Cable Accessories are particularly suitable for installations requiring frequent alteration and are widely specified for hospitals, factories, schools, cinemas, offices and in the shipbuilding industry.



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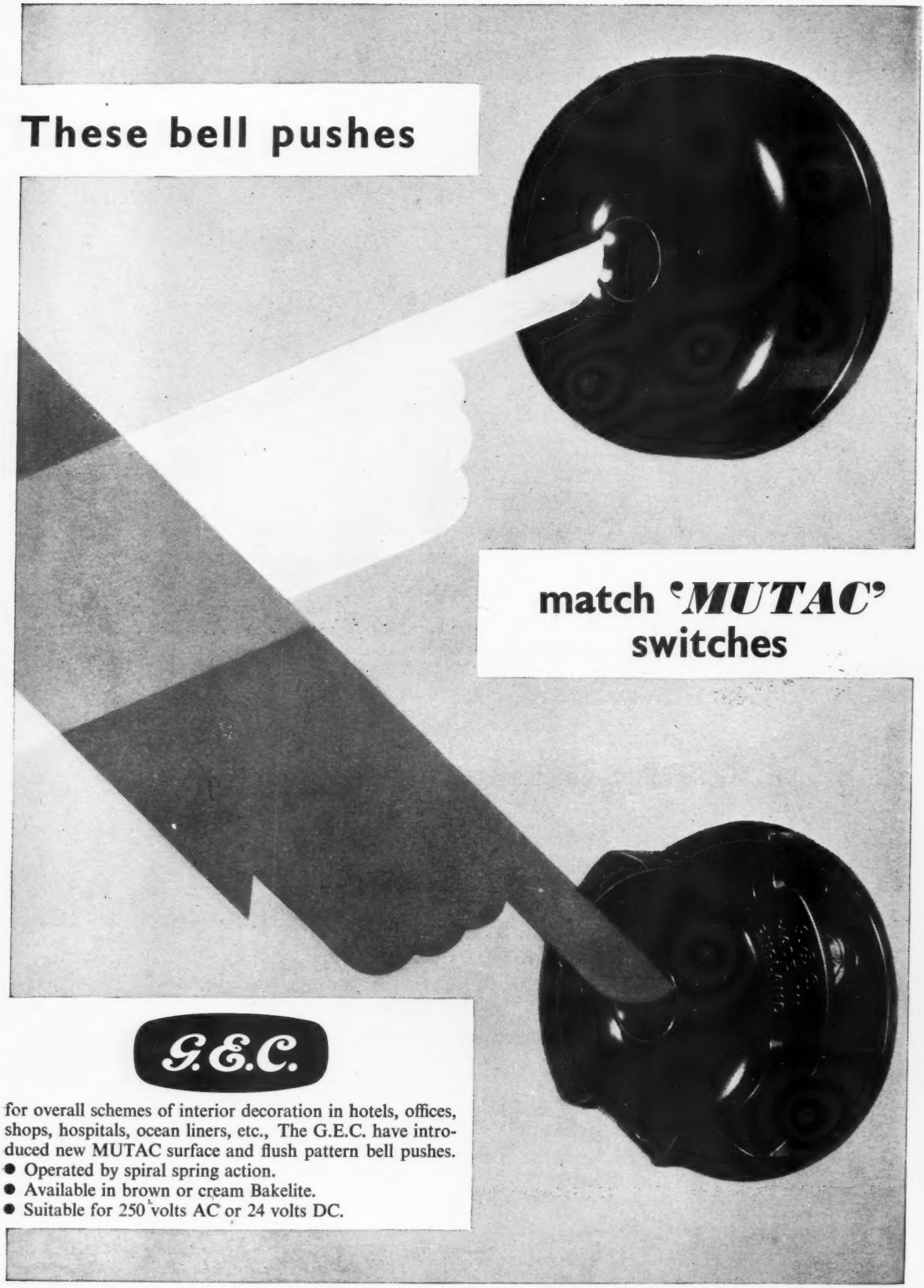
AP270

These bell pushes



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G.E.C.

for overall schemes of interior decoration in hotels, offices, shops, hospitals, ocean liners, etc., The G.E.C. have introduced new MUTAC surface and flush pattern bell pushes.

- Operated by spiral spring action.
- Available in brown or cream Bakelite.
- Suitable for 250 volts AC or 24 volts DC.

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Stud type Regulating Resistors of front-of-board or back-of-board patterns. All resistors are fully tested for correct grading, insulation resistance and minimum high pressure test of 2,000 volts r.m.s. A.C. for one minute.
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Ferrule or wire end type : full range of 24 sizes — 1½—250 watts. List VE 190.

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MODEL "MB"
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Suitable for 15 amps, 250 V. A.C. only.
Standard Instrument 11" stem with ½" B.S.P. pocket.
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AVENUE ROAD·HAMPTON·MIDDX.
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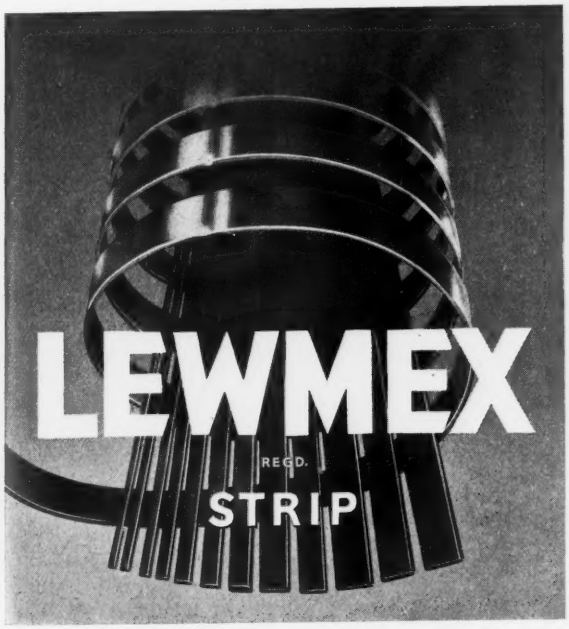

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MODEL 3
Ornamental Unit for Group A Lighting in Town Centres and Similar Situations.

- Designs available for any combination of lanterns (2, 3 or 4).
- Each lantern accommodates four 2ft 40w tubes.
- The centre sphere is a spigot cap suitable for any diameter spigot and can be easily fitted to existing columns.

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PHOTO-FLASH EQUIPMENT • DEAF AIDS
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Factory and public street lights, including the Mazda "NINE" and Benjamin "Duoflux" floodlights, can be very easily made accessible for servicing when L.E.F. Raising and Lowering Gear is installed.
Simply by operating a small hand winch, the light is lowered and, after maintenance, raised again. It is so easy and because it is quicker and requires less manpower, economical too!

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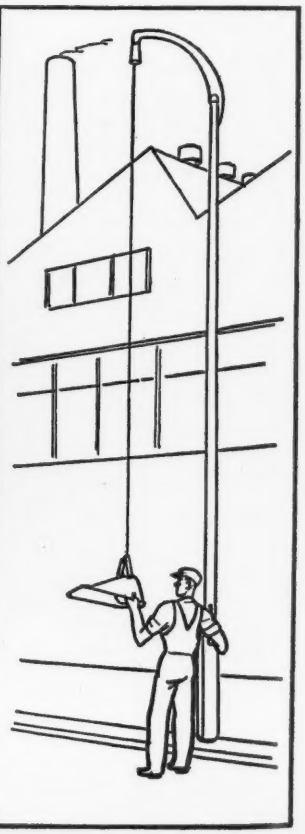

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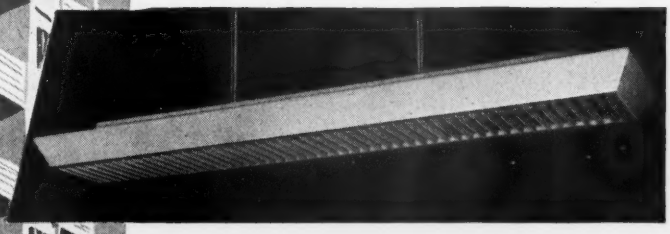
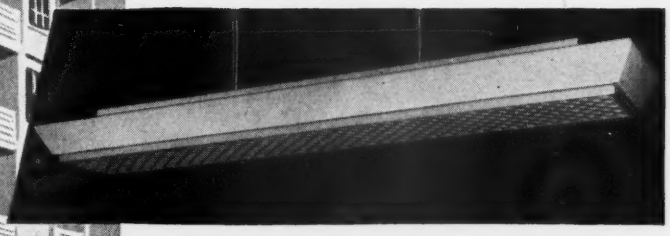
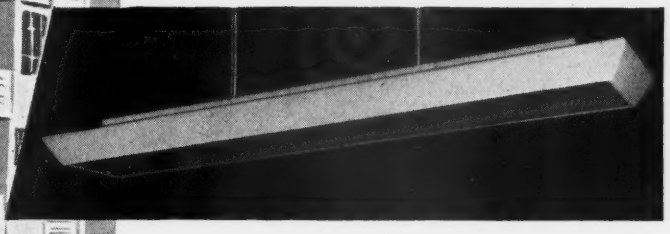
Three of the THAMES range of Fluorescent Fittings by FALKS



FLEET—Gear channel, body and louvre of sheet steel, stove enamelled off-white. The louvre is specially designed to show only the transverse members and has "perspex" shields at each end to conceal the lamp holders.



WANDLE—Gear channel and body of sheet steel, stove enamelled off-white. The louvre is of polystyrene.



EMBER—Gear channel and body of sheet steel, stove enamelled off-white. The lower panel is of $\frac{1}{4}$" reeded clear "perspex".

The "THAMES" range of decorative fittings for fluorescent lamps has been designed to provide a range of 30 fittings from a small number of basic parts. Comprising five simple designs with six lamping possibilities in each; 2, 3 or 4 Lamps in 5 ft 80 watt or 4 ft 40 watt sizes. It will provide a fitting to suit the requirements of every interior from the point of view of both appearance and luminous output.

Designed by R. F. Steward, L.S.I.A. of Falks

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AP-17

NEW busbar material carries the same load and costs less

Noral D50S alloy busbar on a switchboard constructed by The English Electric Co. Ltd. for Richard Thomas & Baldwins Ltd. These bars are designed for a maximum rating of 3,000 amperes.

Here is something new in busbar materials—an aluminium alloy that combines strength with lightness and high current-carrying capacity.

Noral D50S, newly developed specifically for busbars, has these properties:

Minimum ultimate tensile strength—13 tons sq. in. Minimum 0.1% tensile proof stress—10.5 tons sq.in. Electrical resistivity—3.133 microhm-cm. at 20°C. Temperature coefficient of resistance —0.00364 °C.

In terms of the efficiency of a busbar installation, these figures add up to the significant fact that a light, low-cost Noral D50S installation can be the *mechanical* equivalent of its counterpart in copper. Moreover, the resistance temperature coefficient of this alloy, being lower than that of electrical purity aluminium, largely offsets its slightly lower conductivity at working temperatures.

When it comes to economics, an aluminium busbar is a sound proposition indeed. Add to this initial advantage the properties now offered by Noral D50S alloy, and you have a material that will inevitably become first choice for all types of installation. *For further details please write to our Sales Development Division, Banbury, Oxon.*

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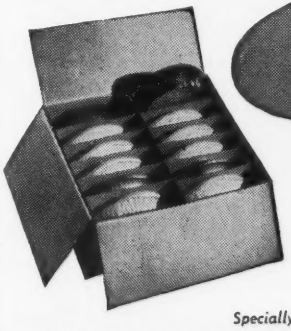
R.E.A.L. Plinths are individually wrapped in crystal-clear 'Cellophane' to keep them in perfect condition during handling and inspection. Packed too in Rail Certified Containers holding twelve Plinths of a size. Packing and Carriage paid. Broken quantities, plus part cost of packing and carriage.



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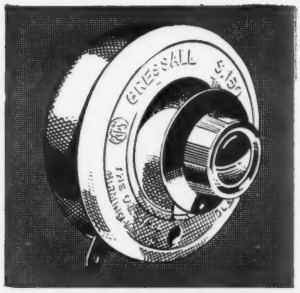

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POTENTIOMETER-RHEOSTATS

Cressall Torostats are a particularly robust form of vitreous enamelled toroidal potentiometer on a ceramic base. This construction gives great mechanical strength and good heat dissipation. Cressall contact brush design ensures perfect contact with negligible wear.

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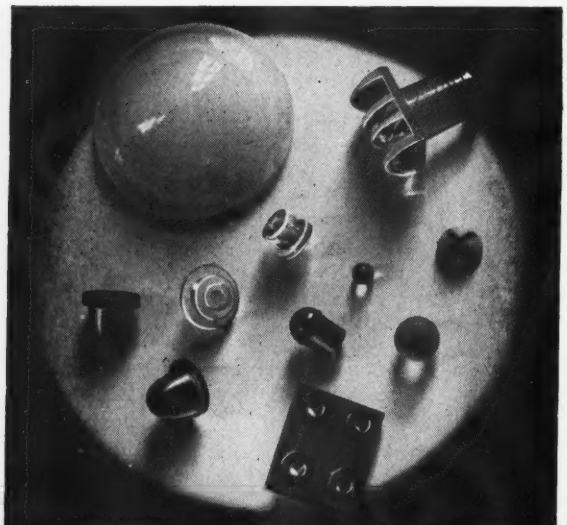

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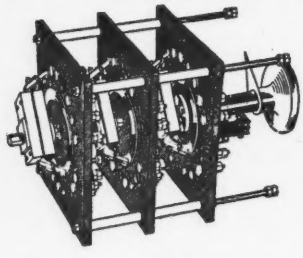

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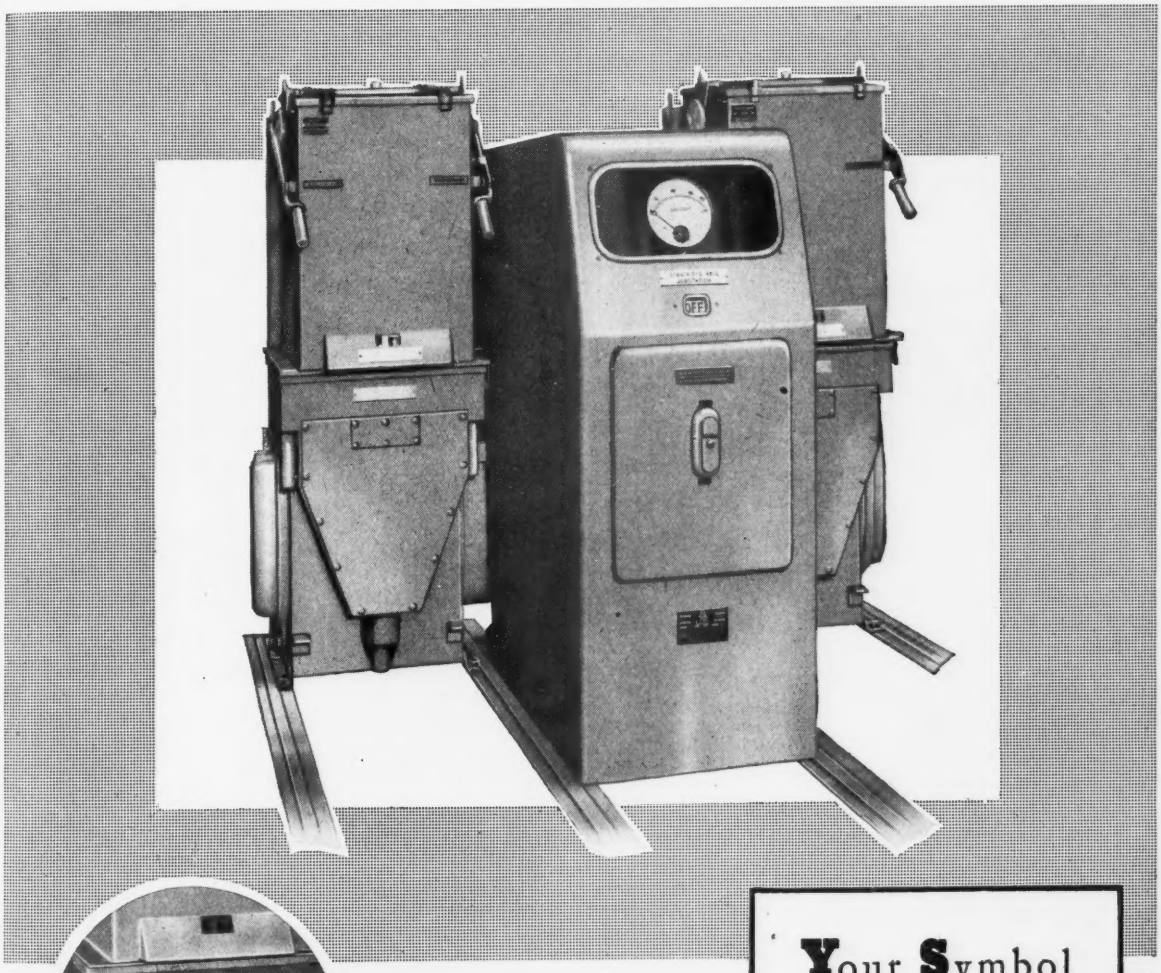

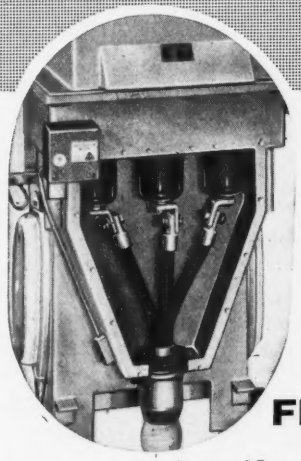

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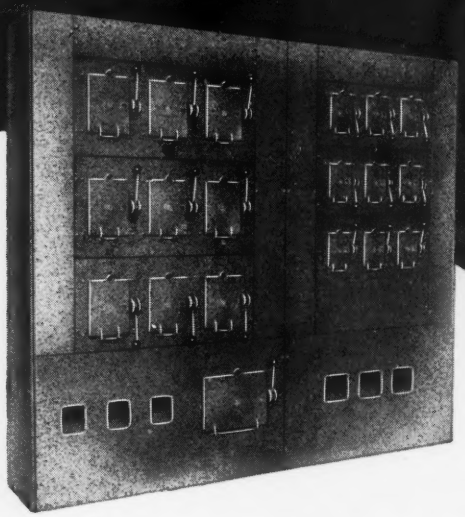

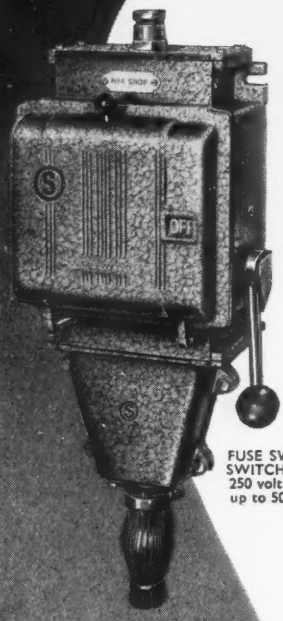

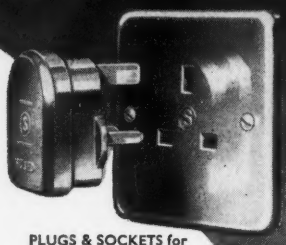

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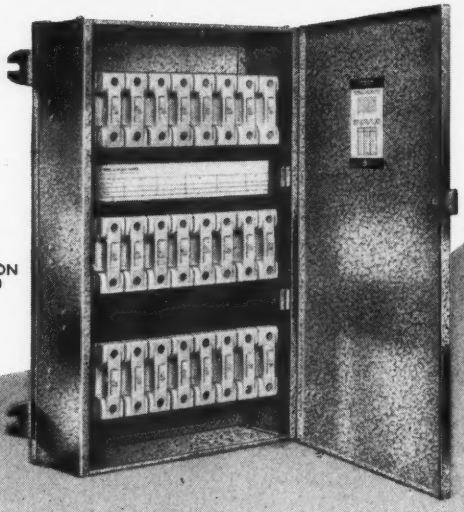

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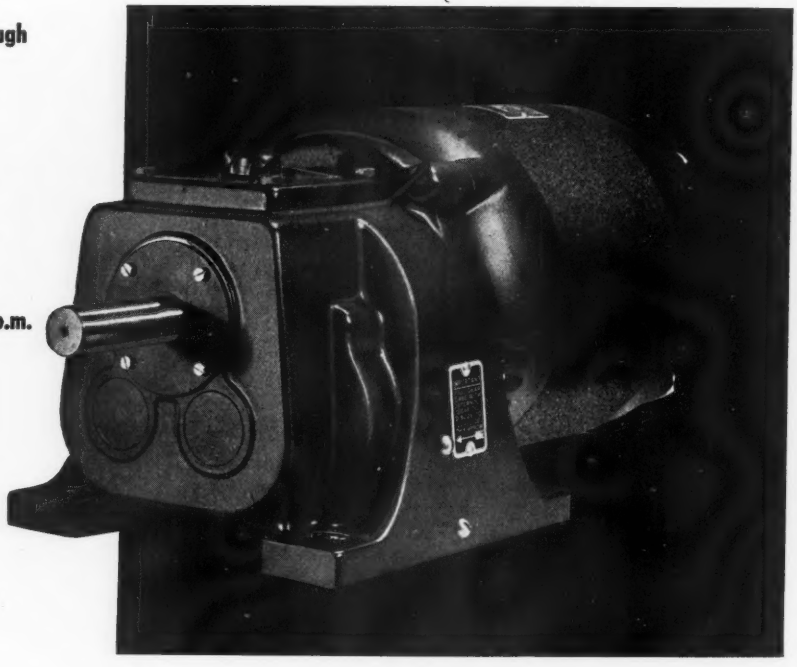

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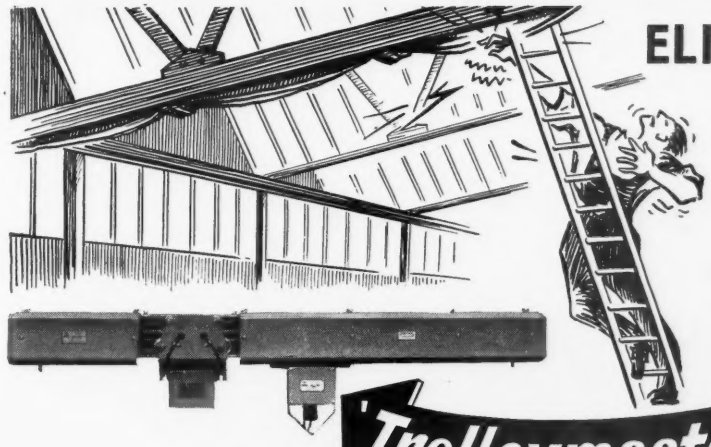

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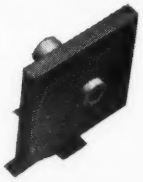

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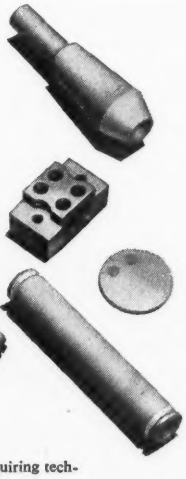

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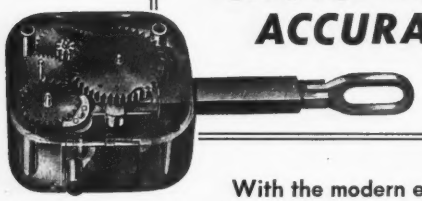

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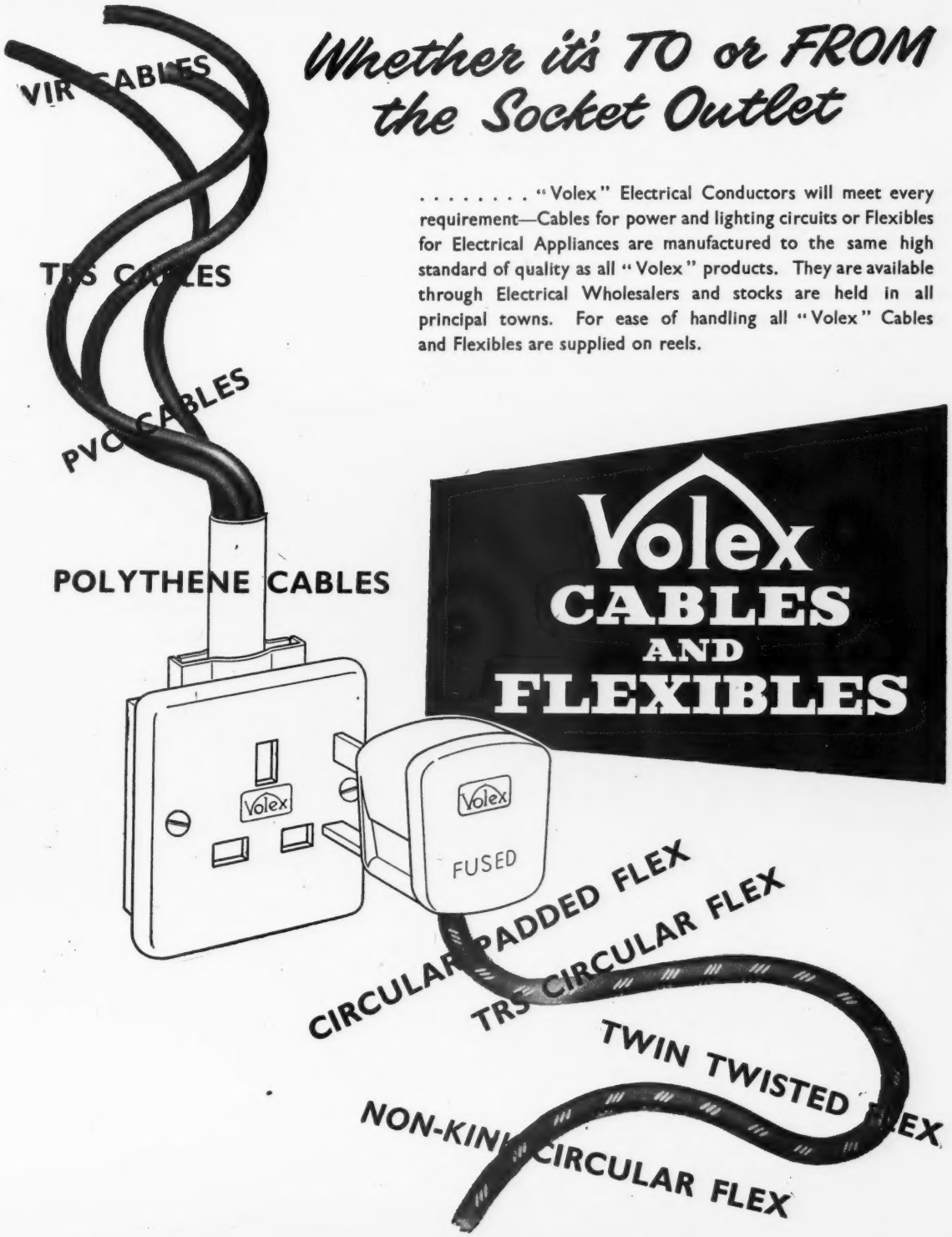

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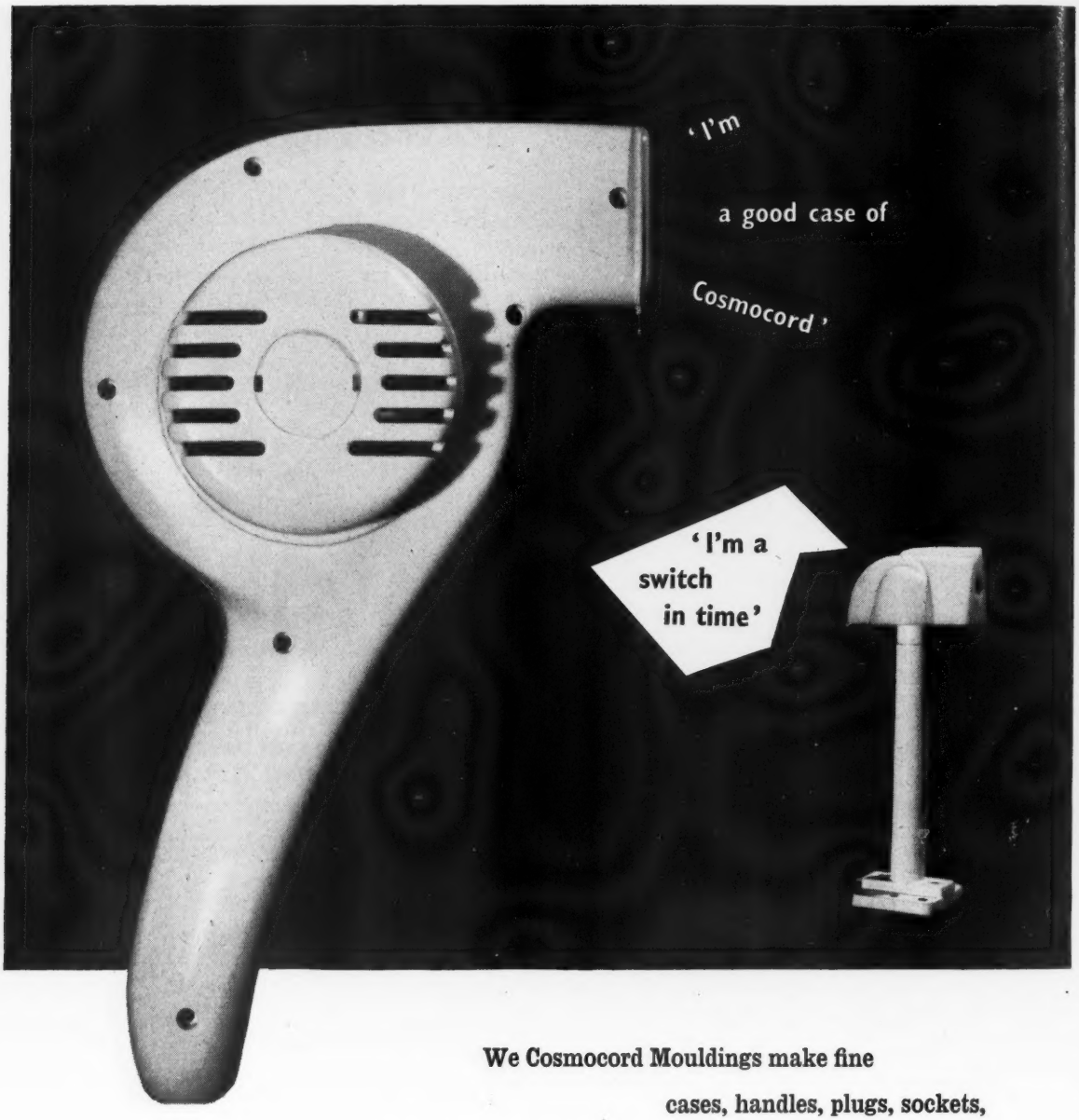

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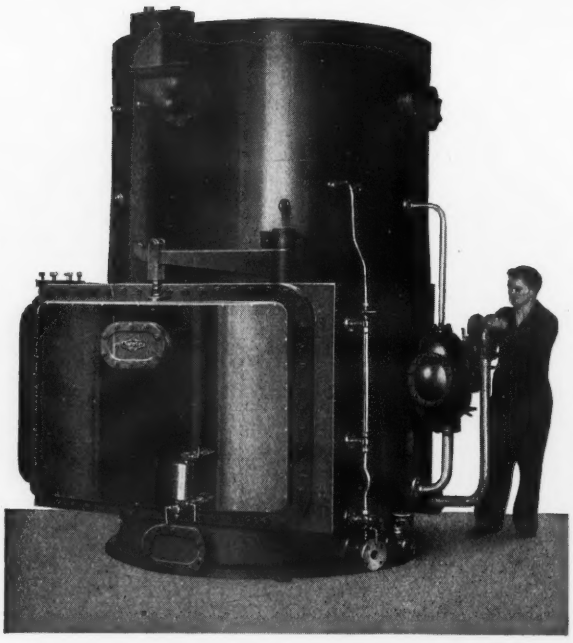

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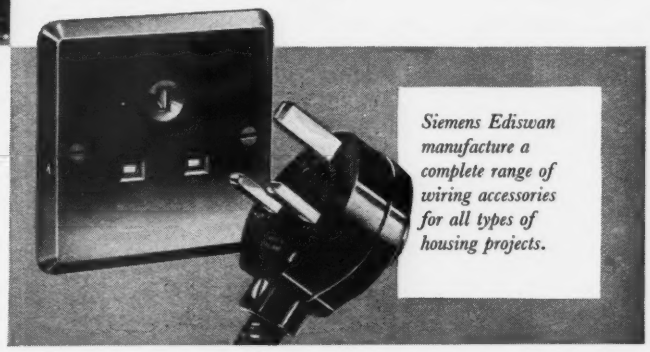

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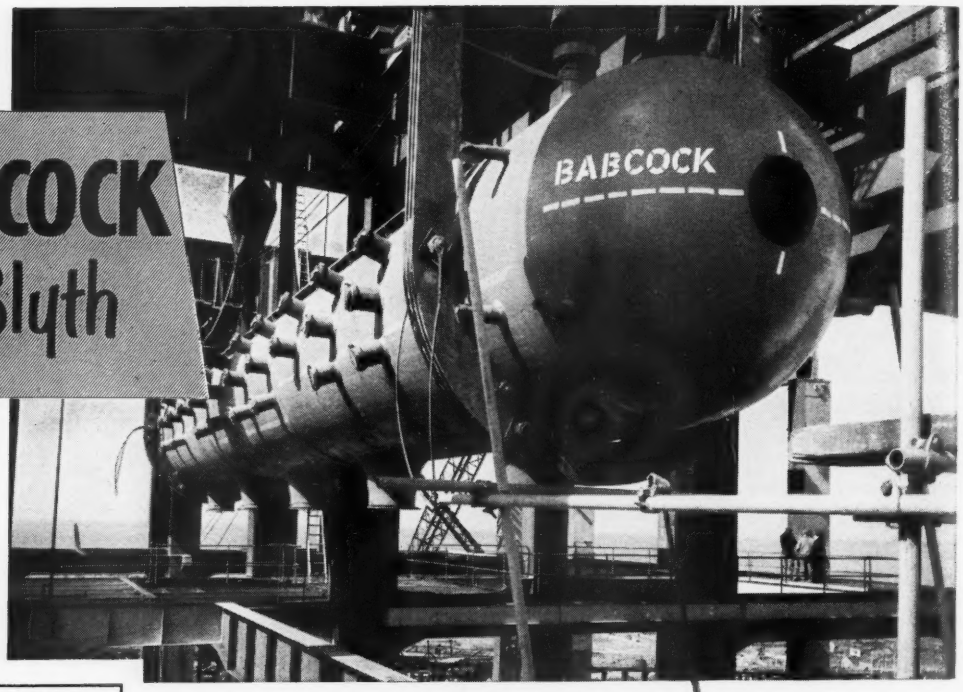

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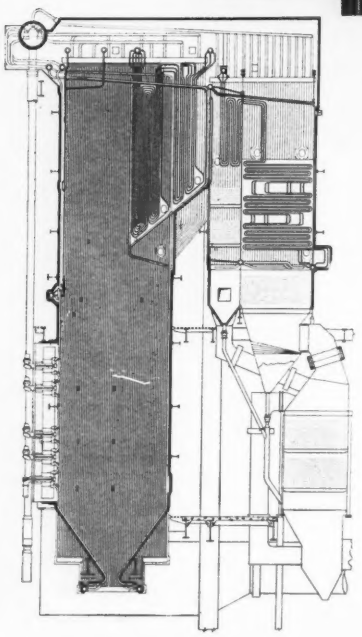

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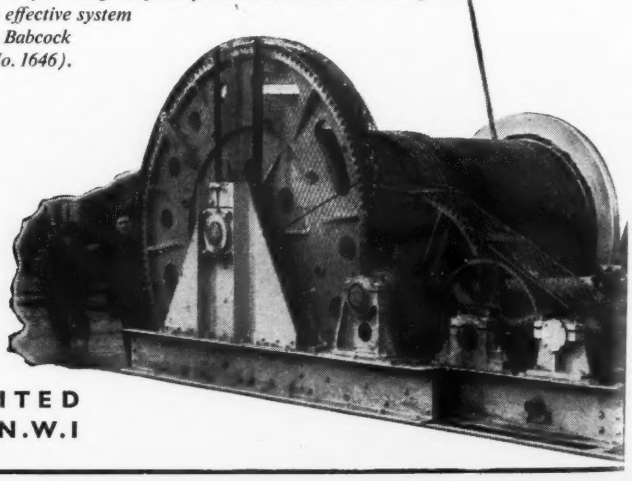

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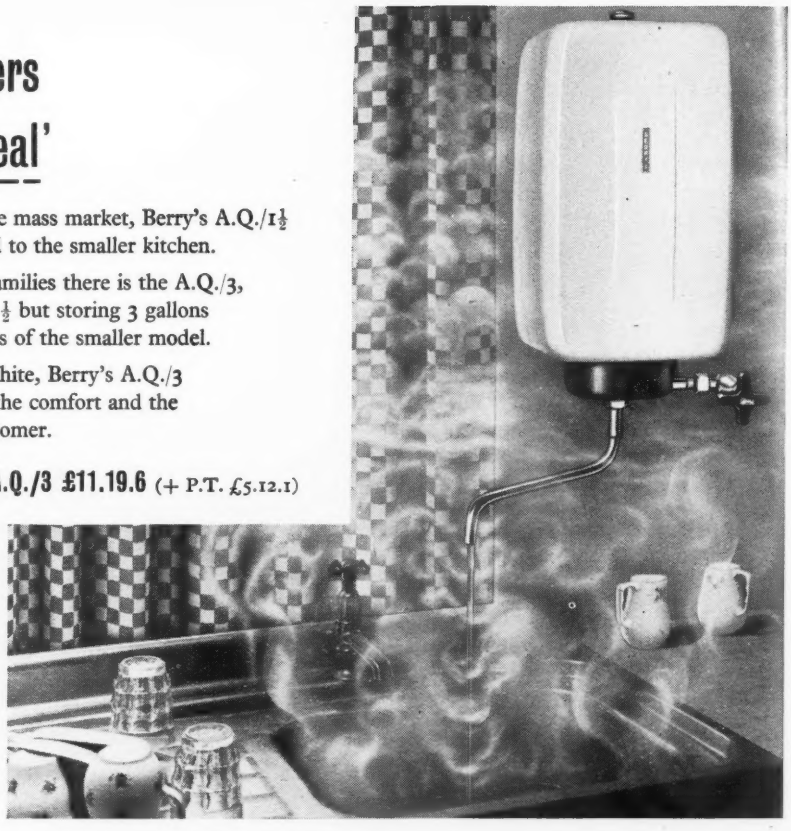

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Utilisation Research

THE term "operational research" came into very general use during the last war to denote research into the performance and operation of a process or an enterprise regarded as an entity, as distinct from research into the materials and physical equipment made use of. The same idea applied to electricity supply became research into the workings of the supply system, *qua* system, looked at from the receiving end as a service to consumers. Hence the name "utilisation research." Such research forms a distinct field of study with a technique of its own, and its measurements concern not so much material objects, like dielectrics and switchgear, as more elusive concepts, such as diversity and appliance saturation.

Before the nationalisation of the supply industry such research could be effectively carried out only by the Electrical Research Association who, in addition to their more material investigations also made some study of consumption characteristics. One of the earliest pieces of work of this kind was an investigation into the voltage variation at consumers' terminals, and this was followed by the first attempt at a direct measurement of the diversity of water heaters. A section was formed under the heading "Electricity Supply Technology" to deal with load and consumption studies and operational problems unconnected with particular materials or apparatus. After nationalisation this work was taken over by the industry, and the Utilisation Research Committee was formed, representing the Central Authority and the Area Boards.

Probably the most ambitious piece of work carried out in this field was the Sampling Survey of Domestic Consumers made in 1946 by the E.R.A. and again in 1955 by the C.E.A. The latest document relating to this Survey is reviewed on page 847 of this issue, and it is good to know that all the results are shortly to be consolidated and made available to the public in a convenient form.

There can be no question as to the very great value of utilisation research both to the industry itself and to the country which invests so much money therein. Anything which adds, even fractionally, to a more efficient use of this investment in supply equipment is to be eagerly welcomed, and a proper application of the results of utilisation research can do this. The Herbert Committee laid great stress on the importance of research (including that on utilisation) and criticised the industry for leaning so heavily on outside research organisations, particularly those of the manufacturers. But in the field of utilisation research there are no outside organisations to lean on, and if the industry does not itself investigate consumption characteristics nobody else will.

DOUBTFUL REMEDIES

To combat inflation the Government has instituted measures for the restriction of credit and investment. Some such measures may be regarded as essential; there is evidence all around of misdirected capital expenditure. Unfortunately it does not seem possible to exercise the discrimination which is needed if the national economy is not to be further damaged rather than repaired.

Is it wise, for instance, to retard the nuclear power programme and the modernisation of the railways, to say nothing of telephone development? It is axiomatic that progress depends to-day on electrification so that any slowing down in the provision of generating plant, while securing a temporary advantage, means trouble in four to six years' time, and we have already experienced this kind of trouble. If the cuts are applied to distribution expenditure the results will also be adverse, for reinforcement as well as extension is a crying need.

As regards the railways, their parlous condition can only worsen if modernisation is not proceeded with according to plan. The Chancellor has said that expenditure upon roads is not to be reduced. Railway modernisation is calculated to relieve the roads by attracting traffic from them, probably a quicker method of relieving congestion than extending the road system.

SEMICONDUCTOR DEVICES

The post-war years have seen a remarkable increase in the use of semiconductor devices in radio, television and industrial electronic equipment, but the field of application for these devices was considerably widened in 1952, when a large-area rectifier, the p-n junction, was introduced. This was followed in 1953 by the production in this country of the first germanium high-power high-voltage rectifier, with a rating of 300 kW.

The importance of this improved means of power conversion over earlier forms, and the prospect of using other semiconductor materials, such as silicon, for high-power applications, was soon appreciated, as was the possibility of making power devices with similar electrical characteristics to the thyratron valve and using more than one p-n junction. In view of this the B.T.H. Co. has built a new factory, which is dealt with on page 839, in an effort to provide the best possible working conditions for the manufacture and development of the basic materials and of the high-power germanium and silicon semiconductor products.

WATER POWER PROSPECTS

Limits to the use of water power, normally set by overall cost comparisons with coal or oil, seem likely to be considerably extended in the future. Improved efficiencies of turbines, particularly of the low-head type, and fabrication of larger alternator frames, have done much to further this aim, but the main contribution appears to be coming from civil engineering developments. A report of the United Nations indicates the great strides that have been made since the war in mechanisation of excavation, earthwork and concreting. To this can be added the introduction of new and often cheaper materials of greater strength and durability. The effect has been not only to lower initial costs but also to lessen the time taken in the construction of new power stations, during which the expenditure is swollen by capitalised interest charges. These advances are making feasible projects once regarded as impracticable because of adverse geological conditions or because of their vast scale.

OIL-FILLED CABLES

For underground power transmission at high voltages the oil-filled cable has been firmly established for many years, hundreds of miles having been installed on power system networks at home and overseas covering the complete transmission voltage range. In service, oil-filled cables have proved their reliability under arduous operating conditions.

The mass-impregnated h.v. cable has voltage limitations and is prone to the formation of voids in the insulation which ionise and cause the dielectric to deteriorate. The oil-filled cable is completely impregnated with a thin mineral oil under all operating conditions and thus ionisation is eliminated. The most widely used system voltage for which pressure cables are employed is 33 kV and although the conventional design of oil-filled cable at this voltage is economical, it has been recognised that if certain techniques already established in other types of cables were extended to oil-filled designs, further savings in initial cost could be made. This has led British Insulated Callender's Cables, Ltd., to develop the new 33 kV ductless, shaped-conductor, oil-filled, three-core cable, which is described in this issue (page 850).

NUCLEAR ENERGY AND PROPULSION

Whenever the many references to the nuclear ship or the nuclear aircraft crop up the question arises—"Does that mean that the ship or aircraft is electrically propelled?" We approached some of the manufacturers to try to get the answer to this question in respect of ships and one of the large boiler makers tells us:—

> "The question as to whether electricity is involved in the main propulsion depends basically upon the disposition of the nuclear reactor and main propelling machinery. Where the power and driving units are located in the stern of the vessel, as is the practice in most tankers, the propeller shaft is normally driven direct from the steam turbines through suitable gearing. However, if the power and propulsion units are located amidships, thus involving the use of an excessively long propeller shaft, the mechanics of the proposition becomes impracticable, and some means must be devised to reconvert the energy of the steam turbines into rotary motion at a point which will considerably shorten the length of the propeller shaft. In that case it is feasible, and more than likely, that the propeller shaft would be electrically driven."

A little further light was thrown on the matter as regards aircraft by Dr. J. V. Dunworth in an address to the Royal Aeronautical Society at Folkestone recently when he said that there was little doubt that a nuclear powered aircraft could be built, but the only application which appeared to have received much attention so far was a supersonic low level bomber. Reaching the prototype stage would involve very large numbers of scientific and technical staffs and take at least 15 years.

Industrial Influence on Public Electricity Supply

6. PAPER AND PRINTING

By A. E. MARCHANT, M.Sc.Tech., M.I.E.E., A.M.I.Mech.E.

PAPER and printing have been an integral part of human progress for over five hundred years. Our civilisation is founded on the recorded word, with which the spoken word can never effectively compete. Over the last century in particular, improvements in the technique of paper making and printing have had a far-reaching effect on our way of life.

One hundred years ago the population of this country was less than half what it is to-day, whilst only one in three could write their names and there was little leisure for reading. However, with the growth of population and literacy paper production has increased forty times. During last year it amounted to 2·4 million tons or 105 lb per head of population, and this industry to-day employs over half-a-million people. Improved communications resulting from the development of paper and printing have made the introduction of modern large-scale organisation possible.

The provision of economic supplies of electricity has been made possible by paper used as an insulating material for electrical plant, particularly underground cables. In the case of the latter, limits of voltage were early reached in which the employment of vulcanised india-rubber for dielectrics ceased to be commercially practicable. Generally, the quality of paper and its impregnating compounds was more uniform, and more consistent results were obtainable than with other dielectric materials available. As a result impregnated paper has been adopted almost universally as a standard for all classes of power cables.

The output of the whole paper and printing industry is of such a magnitude that it is listed as one of the major industries in the Standard Industrial Classification. It is further sub-divided into the smaller groups set out in Table 1, from which some idea of their relative importance can be judged. As is to be expected, the printing industry is found close to its market, namely, the larger centres of population and commercial activity, and the paper required is made as near as possible to where it is used. This is borne out by Table 2 which shows that a large proportion of this industry is found in and adjacent to London.

Paper Manufacture

The first group considered, namely, paper (No. 180), accounts for a greater use of electricity than any other group. Paper is composed of vegetable fibres, e.g. cotton, esparto grass or wood, interlaced and finally

TABLE 1.—PAPER AND PRINTING INDUSTRY—GREAT BRITAIN*

Standard industrial classification groups	Larger establishments employing more than 10 persons									Small firms employing less than 11 persons
		Number employed		Gross output		Electricity used				
	Number of establishments	Total	Average per establishment:	Total: £ million	Average per establishment: £ million	From public supply: million kWh	Private generation and other sources: million kWh	Total: million kWh	Per establishment: million kWh	
180 Paper and board	275	66,140	241	129·45	0·471	212·1	1,219·6	1,431·7	5·206	45
181 Wallpaper	30	3,931	131	5·32	0·177	2·8	—	2·8	0·093	4
182 Cardboard boxes, cartons and fibreboard packing cases	416	39,665	95	42·93	0·103	22·0	22·7	44·7	0·107	122
183 Manufactured stationery, paper bag, and kindred trades	384	42,415	110	55·60	0·145	24·6	7·9	32·5	0·084	237
186 Printing and publishing newspapers and periodicals	542	84,383	156	105·29	0·194	115·5	Not given separately	115·5	0·213	216
189 Other printing, publishing, bookbinding, etc.	2,518	168,515	67	152·42	0·061	106·1	2·5	108·6	0·043	3,496
TOTAL (United Kingdom)	4,165	405,049	97	491	0·118	483·1	1,252·7	1,735·8	0·417	4,120

* Based on Census of Production, 1948.

TABLE 2.—LOCATION OF PAPER AND PRINTING INDUSTRY*

Regions	Groups—larger establishments employing more than 10 persons						
	Paper 180	Wallpaper 181	Cartons 182	Stationery, bags, etc. 183	Newspaper printing 186	Other printing etc. 189	Total—all groups
London and South Eastern Region:							
No. of Establishments	56	9	133	172	164	972	1,506
Total Output—£000s	37,239	1,502	14,545	24,965	62,630	63,981	204,862
All other Regions in United Kingdom:							
No. of Establishments	219	21	283	212	378	1,546	2,659
Total Output—£000s	92,210	3,814	28,385	30,632	42,661	88,435	286,137
Total in United Kingdom:							
No. of Establishments	275	30	416	384	542	2,518	4,165
Total Output—£000s	129,449	5,316	42,930	55,597	105,291	152,416	490,999

* Based on Census of Production, 1948.

squeezed together to form a sheet with a surface suitable for writing or printing. The commonest fibre to-day is wood, much of which is imported from Scandinavia and Canada in the form of pulp. In the mills, which are built close to the forests, the wood is converted to pulp, either mechanically by grinding the logs into a flour or chemically by boiling with acid and alkali and washing it. The pulp is shipped as thick boards. Other materials, such as size, colouring matter and bleaching agents are, of course, also required for paper making.

Paper, first made in China about A.D. 105, was not known in Europe until the Arabs introduced it into Italy some 700 years later. Little development appears to have been made until the middle of the fifteenth century, when the invention of printing stimulated the demand. A period of intense activity commenced with the invention in 1799 of a machine for the continuous manufacture of paper, the basic design of which has not altered since that time, although improvements have been introduced. The modern counterpart can be over 500ft in length and make newsprint at 2,000 ft/min with widths up to 25ft. The electrical drives and controls of such a machine, installed at the Bowater Paper Corporation's Kemsley Mill, have already been described in detail.* This particular machine with its auxiliary plant requires a supply of 6 MW.

Before the paper-making machine can begin production, the raw material has to be suitably prepared by beating and breaking up the wood pulp boards with water into a uniform mass. The usual type of beater consists of a trough, in which runs a heavy motor-driven horizontal roll or metal cylinder fitted with blunt knives. Beneath this roll is a set of stationary knives. When the pulp mixed with water is passed through the beater, the fibres are separated out. It is in driving these beaters that a large proportion of the power consumed in the mill is used, the amount depending on the quality of the paper being made, since the grade of the finished paper is largely determined by the amount of beating and refining the fibres receive.

After beating, further water is added and the "stock" passes to the chest of the paper-making machine, where the process is continuous and may be considered as four operations. First, the mixture in the chest is diluted further until the resultant stock contains up to 99 per cent of water. Secondly, it flows evenly on to an endless wire mesh supported on rollers, to allow it to drain. This is accelerated by suction on the underside of the wire, which is also agitated to prevent the fibres all settling in the direction of the flow.

Thirdly, the wet web, still containing some 80 per cent of water, passes on to a woollen felt and is squeezed between pairs of rollers. Further drying is obtained by putting it through numerous steam-heated rollers. Finally, the sheet is passed between a vertical stack of rollers, alternately cast iron and compressed cotton or paper. The pressure is gradually increased to give the final paper thickness and smoothness of finish to the surface. Fig. 1 shows such a machine, which makes printing and writing paper 10ft wide at speeds up to 1,000 ft/min. This particular machine will produce up to two tons of paper per hour and represents a load of 250 to 300 h.p., in addition to which its circulating stock and vacuum pumps require a further 120 h.p. As much as 10 tons of steam/ton/hr is used for heating the drying rollers, providing hot air for vapour absorption, and for space heating. The requirements for steam vary according to the type of raw material used.

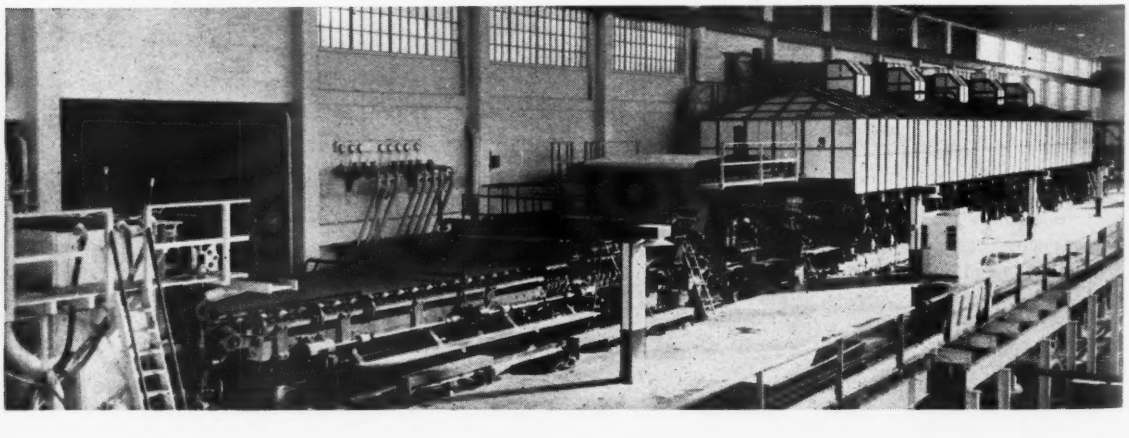
The electrical problems that arise in paper making are those associated with the provision of large power requirements in humid conditions and multi-drives with critical speed relationships. For instance, since the flow of the stock on to the wire is a constant, the speed of the machine as a whole must be controlled within narrow limits. Electronic devices are used for speed controls to-day, whilst the electronic eye also prevents paper piling up should a break occur.

By far the greatest proportion of the power required is for the beating operation. In Fig. 2 is shown a set of beaters used for the preparation of the stock for the machine in Fig. 1. Each is driven by a 200 h.p. motor. Continuous working is desirable, for the machines must be cleaned should the paper-making process be stopped and it is customary for them to operate for days without being shut down. As a result, load factors of the order of 60 per cent are not unusual in this industry, which compares with figures as low as 40 per cent for public supply. The tendency of the paper-making industry would thus be to improve the overall national load factor, particularly if all electricity requirements were taken from public sources.

The need for plentiful supplies of steam and hot water for washing and digesting the raw materials and for heating purposes has resulted in the past in large steam-raising plants being associated with the mills. The provision of low-pressure process steam combined with electricity generation by back-pressure turbines can result in thermal efficiencies exceeding 65 per cent, whereas the average thermal efficiency last year of all generating stations operated by the Central Electricity Authority was only 24·35 per cent. Consequently, the proportion of

* *Electrical Review*, 30th November, 1956.

Fig. 1.—Modern paper-making machine (by courtesy of Bentley & Jackson, Ltd.)



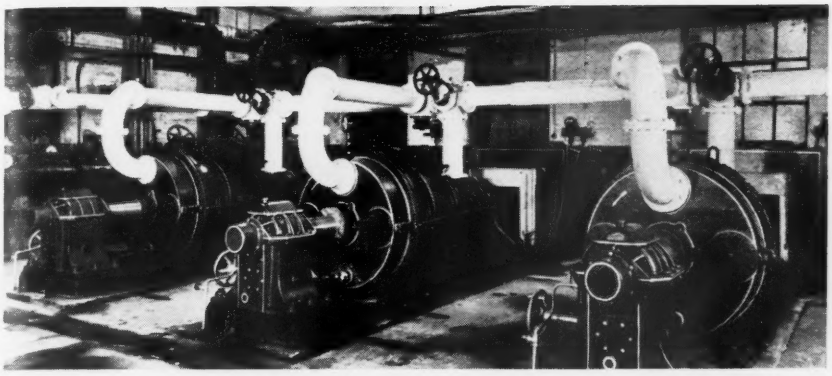


Fig. 2.—Set of refiners preparing pulp for paper-making (by courtesy of Bentley & Jackson, Ltd.)

the electricity requirements generated in paper mills has been the highest of any industry.

However, comparative thermal efficiencies are not the sole factors governing purchases of electricity from Area Boards. With the present acute shortage of capital in this country, industrialists are inclined to invest in production machines rather than generating plant, particularly having regard to the relatively high capital charges of the latter. Public supply, with its wider field of operation, can offer better standby facilities. When supplying a variety of consumers with widely different load characteristics, the beneficial effects on overall costs can be more than with the smaller plants of individual consumers. The latter, because of their size, must rely on conventional fuels and the extension of generation by nuclear power could exercise a considerable effect on this position in the future.

The requirements of the paper mill and the generating station are similar, namely, a plentiful supply of water and steam at a site with good transport facilities, so that one might expect to find them in the same locality. A paper mill has been, in fact, sited adjacent to one of the Central Electricity Authority's generating stations in Wales. The station not only supplies the electricity requirements to the mill but also provides a supply of steam. With such an arrangement the mill concentrates solely on the production of paper. This development may be a preview of the future, as it would seem to be an ideal arrangement. In Canada a further development has been the raising of process steam by electricity for paper making. Such an arrangement would not, however, be economical in this country.

Newspapers and Periodicals

The finished paper serves as a raw material for the next group to be considered, namely, the printing and publishing of newspapers and periodicals. Some idea of the ramifications of this section of the industry can be formed from the fact that 3,908 separate periodicals were published in the United Kingdom last year. An indication of the daily and Sunday newspaper distribution, for example, is as follows:—

	Type of Newspaper		
	Morning	Evening	Sunday
London	16	3	11
Remainder of England and Wales	23	68	3

In London alone over three million copies are sold every night, whilst the combined circulation of the six largest national daily papers is of the order of 15 million. It is only during the last sixty years or so that electricity has made it possible for clean and readable newspapers to be printed at the high speeds and low costs which are an accepted fact to-day.

The greatest centre of newspaper activity — Fleet Street—is in a very congested area of the City of London, where the great national newspapers are printed adjacent to sources of news and with convenient access to the large railway termini. The highly specialised staff responsible for collecting and editing the news and designing the newspaper layout have offices usually in or near to the building where the paper is printed, and in the vicinity are the various services associated with newspaper production. The restricted sites have not lent themselves to ideal production layouts, although rebuilding of the City after war damage is enabling some improvements to be effected. In fact, the real problem to-day is not so much speeding up the output of the presses, but in getting the papers away from the newspaper offices. (Fig. 3).

The actual printing process starts with the setting-up of metal type and picture blocks in a frame, from which a clear impression of the page is pressed into a papier-mache board. From the resulting mould a curved stereo plate is cast from type metal. The cast plate can then be fitted to the cylinders of the rotary printing press. Large rolls of paper are continually fed into the press, and after printing it is automatically cut and folded. The completed newspapers then pass by conveyor to the loading bay for bundling and dispatch by motor-van.

The modern printing press illustrated in Fig. 6 is capable of producing up to 1,000 copies a minute, and comprises three components, viz. the magazine reelstands at floor level, the horseshoe-shaped printing units, and above them the folding mechanism. The particular press illustrated, whilst fundamentally designed to print newspapers in black and white, can be adjusted for printing in colour when required. Each of the seven printing units is driven by a 40 h.p., three-phase, shunt-wound commutator motor, with infinitely variable speed from

Fig. 3.—Speedy dispatch is one of the newspaper problems. Typical scene near Fleet Street

32 to 1,650 r.p.m. In addition, there are 52 auxiliary motors with their protective equipment and an elaborate push-button control.

The utmost speed of production is essential for quick dissemination of news. The printing of the number of copies required is true mass production and would be impossible without the use of electricity. In addition to driving the paper feed, type and impression cylinders, ink rollers and folding mechanisms, electricity finds many other applications in the production of newspapers. Should the paper break, it provides instant detection and controls the associated braking mechanism. Other uses include ink and paste pumps, transmission of pictures by telephotography, lifts to deliver the paper rolls to the presses, newspaper conveyors, linotype machines, and counting mechanisms, in addition to such normal uses as lighting, heating and ventilation.

It is customary in newspaper offices to provide ample plant, thus obviating delay in the event of breakdown. A detailed description of electrical practice in newspaper printing was given in a paper* presented to the Institution of Electrical Engineers by Mr. A. T. Robertson, from which the information in Table 3 is derived. Most of the electricity for such offices is taken from the public supply mains. The news service, highly competitive as it is between individual papers, is of such importance that the fundamental requirement must be reliability of supply. This, however, has not resulted generally in the installation of standby generating plants—probably due to the congested sites. Instead a multiplicity of supplies from different public networks appears to have been the usual practice. Prior to the Electricity Act, 1947, some offices were taking supplies from two different electricity undertakings with emergency change-over arrangements, and this use of two separate and distinct networks has been preserved.

In Fleet Street direct current supplies have been general and have been particularly suitable in providing the requisite smooth variation of press motor speeds, which must extend from crawling, when initially the paper is threaded in, up to full speed. Reliable " inching " is also necessary when fixing the stereo plates on the press. So effective have these supply arrangements been that schemes for change-over to alternating current in this area have tended to be retarded. However, this influence is receding with the more extended use of electronic devices to perform complicated functions, as such equipments make the provision of an a.c. supply essential, whilst modern a.c. motors fully meet the requirements for these drives.

To provide the latest news at breakfast time the morning newspaper must be printed at about midnight, at a time when the electrical demands of most other consumers are at their lowest. Similarly, printing of the evening paper commences before lunch and may finish at about 5 p.m. In addition to the printing load, there is the normal load for the offices of the editorial and other staff. The incidence of the load, and hence the load factor, varies according to whether a morning, evening, Sunday or weekly newspaper is being produced as can be clearly seen from Table 3. Completely subordinated to the quick and efficient dissemination of news, demands on the supply may not be so predictable as in some industries. The total of all demands on the national system and the type of demand a group of newspaper offices can make on the public supply are illustrated in Figs. 4 and 5. The load, in general, has little seasonal variation and variations of 10 per cent in monthly consumptions are unusual.

Growth of load in the future will be governed largely by the changes in the newspaper itself, such as the use of more colour in production, for modern presses can be adapted for printing in several colours. The fitting of additional colour-printing units, however, will increase electricity requirements.

Although with the recent withdrawal of restrictions on newsprint larger newspapers are now possible,† production costs must be higher and, notwithstanding the extra advertising space made available, an increase in the price per copy may be necessary, tending to check circulation.

* " Electricity in Newspaper Printing "—Proceedings of the Institution of Electrical Engineers, No. 117, May, 1952, Vol. 99, Part 1.

† Since this article was written newspapers have increased in both size and price and in some cases coloured illustrations have been introduced.

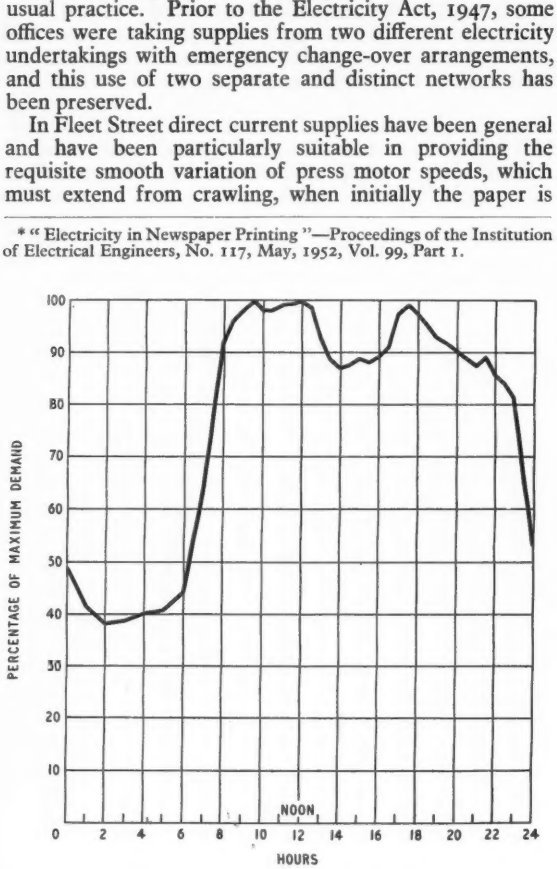


Fig. 4.—Demands on the national system, 2nd February, 1956

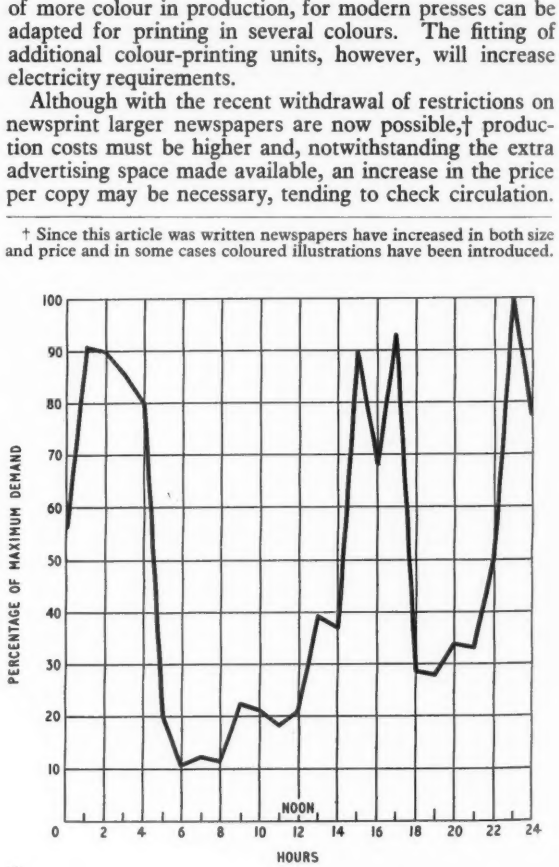


Fig. 5.—Load curve of a group of newspaper offices

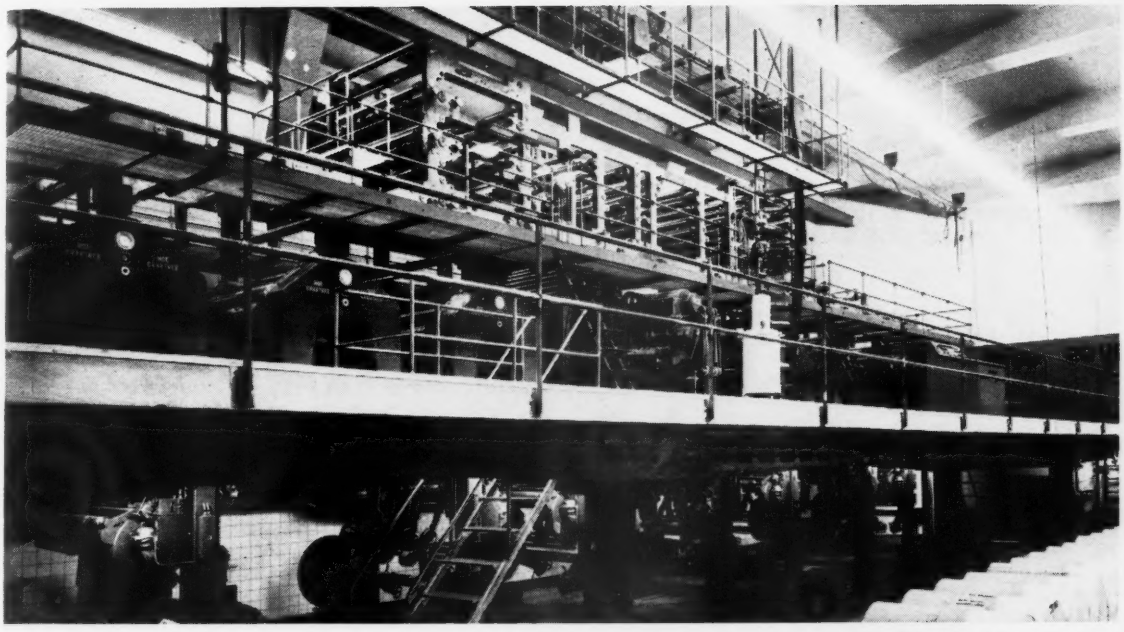


Fig. 6.—Typical seven-unit "super-colour" rotary newspaper printing press (by courtesy of R. Hoe and Crabtree, Ltd.)

Nevertheless it can be assumed that newspapers will become larger, consequently increasing the demand on the public supply, since the electricity used is proportional to the number of pages printed.

General Printing

By far the greatest number of establishments in the paper and printing trades are engaged in bookbinding, publishing and general printing. General printers are usually found adjacent to centres of commercial activity. For example, there are nearly 2,000 such establishments in or near the City of London engaged in book publishing and the production of such varied items as postage stamps, banknotes, playing cards, books and ledgers.

The relative smallness of most of the general printing establishments is apparent from Table 1, since nearly 60 per cent employ fewer than 11 persons, which means that production methods cannot be as fully automatic as those of the larger undertakings in the other groups. The size of these establishments (Group 189 in Table 1) is also reflected in their average electricity consumption, which is the lowest in the whole industry. In consequence they are usually supplied from the medium-voltage network at tariffs applicable to the smaller users. Their work may be regarded as a normal industrial process carried out during normal working hours and so has not the high load factor characteristics of the paper mill with its continuous process working or of the newspaper office with its night printing, whilst the variation of demands made on the public supply are dictated largely by the day-to-day demand for their varied products. The continued growth of demand for these products, combined with the steady improvement in production methods, must result in increased consumption of electricity.

The influence of paper and printing on public electricity supply can be summarised generally under four headings:

(1) Direct effect of paper as an insulating material for such items as underground cables.

(2) The vital influence on modern society and industry of means of communication and record made possible by the printed word.

(3) Improvement in overall load characteristics of the public electricity supply by the connection of large continuous loads of high load factor, such as in paper mills, and by the use of the public supply for newspaper printing which, controlled as it is by the times of publication, can have a desirable night component.

(4) Future growth of electricity consumption by the various groups which make up this industry. Particularly is this so in paper mills, the huge potential load of which could be met from public sources. Requirements for newspapers, and particularly the general printing load dispersed in smaller establishments, must continue to increase in normal times.

Acknowledgment is due to the London Electricity Board and to friends in the paper-making and printing industry for information embodied in this article.

Previous articles in this series were:—1. Coal, 14th Sept., 1956 (p. 459); 2. Textiles, 19th Oct., 1956 (p. 722); 3. Agriculture, 7th Dec., 1956 (p. 1037); 4. Steel, 22nd Feb., 1957 (p. 319); and Chemicals, 9th Aug., 1957 (p. 227).

TABLE 3.—CONNECTED LOAD, M.D., AND ANNUAL LOAD FACTOR

Office	Publications	Actual production million pages per week	Annual consumption million kWh	Number of pages per unit	Connected load kW	Maximum demand in 1950		Annual load factor (based on daytime demand) per cent
						Night kW	Day kW	
1	M, E and S	68·2	5·81	610	5,200	1,340	960	69
2	M and E	19·2	1·92	520	2,920	440	640	34
3	M and S	46·4	2·13	1,130	2,570	920	330	74
4	M and S	54·0	1·46	1,920	1,940	570	210	80

M:—Morning. E:—Evening. S:—Sunday. Standard page size, 24in × 18in.

Graphical Recording

An Accurate Electroluminescent Unit for a Digital Computer

By T. KILBURN, M.A., Ph.D., D.Sc., G. R. HOFFMAN, Ph.D., B.Sc., and R. E. HAYES, M.Sc.

THE graphical recording of a set of results is a well-established technique. This is probably because the pictorial method of representation allows complex information to be easily assimilated. A large number of results obtained from the Manchester University computing machine have been plotted by hand and this article is a review of a device designed to eliminate this chore.*

In the past, graphical records have been made by photographing conventional cathode-ray tube displays, or direct ink recording on electro-mechanical devices. Both these systems are of limited accuracy and the mechanical unit has a slow operating speed particularly noticeable during random plotting operations. In the device described the graphical output is provided by a uniform layer of electroluminescent phosphor embedded in plastic with a parallel set of conductors, mutually perpendicular, on each side of the layer (Fig. 1). The conductors thus form an X.Y. co-ordinate matrix and the selection of one conductor from each set defines a spot position at their intersection. The application of an alternating potential between the selected conductors causes the phosphor to fluoresce at this spot position. Various points of the matrix may be selected sequentially and the light pattern photographed. Photo etching techniques have been used in the manufacture of these panels and a spot position is thus determined by a master negative which has been fabricated to fine limits. The high order of accuracy easily obtained, the inherent stability, and identical replacement panels, make the device an attractive proposition.

The unit itself has 512×512 orthogonal conductors. The conductors are ten thousandths of an inch wide spaced at four thousandths of an inch, and cover an area of 7×7 sq in. The transparent conductors are formed by an evaporated layer of bismuth oxide and gold suitably etched. Such a panel may be regarded as being equivalent to a sheet of graph paper with over a quarter of a million "spot" positions. The remaining area of a 10×10 sq in glass supporting panel is used to accommodate a "flag" pattern of bonded silver conductors, the flags being of sufficient size to allow an electrical soldered connection to be made to each conductor. A prototype matrix with 128×128 conductors at 50 to the inch is more easily reproduced here and is shown in Fig. 2.

Discrimination Ratio

One method of operating the E.L. matrix is to apply voltages to the selected x and y co-ordinate conductors, these voltages being anti-phase but with equal peak-to-peak amplitude of $\frac{V}{2}$ volts; a peak-to-peak voltage of V will then appear at the wanted intersection (xy). If all the other electrodes are at earth potential, a peak-to-peak voltage of $\frac{V}{2}$ appears between the selected row or column and the other earthed conductors. Unwanted spot positions along the selected ordinate and co-ordinate thus luminesce, but with lower intensity. The ratio of wanted to these unwanted brightness levels is defined as the discrimination ratio. In this graphical output application the photographic film recording the wanted luminescent spot pattern is continuously exposed to the lower brightness levels at the unwanted spot positions. The images of these unwanted spot positions will thus accumulate as the wanted spot positions are sequentially selected. The discrimination ratio therefore gives an indication of the number of selected spot positions which may be recorded before a serious background interference becomes apparent, and this ratio must be as high as possible.

In the I.E.E. paper the discrimination ratio is considered in some detail. This ratio depends on the operating brightness level of the panel and improves rapidly as the brightness is lowered (i.e. the voltage reduced). Measure-

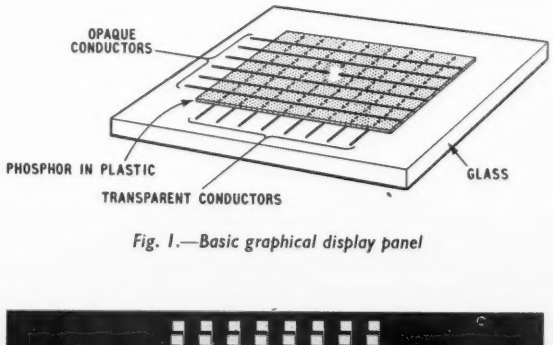


Fig. 1.—Basic graphical display panel

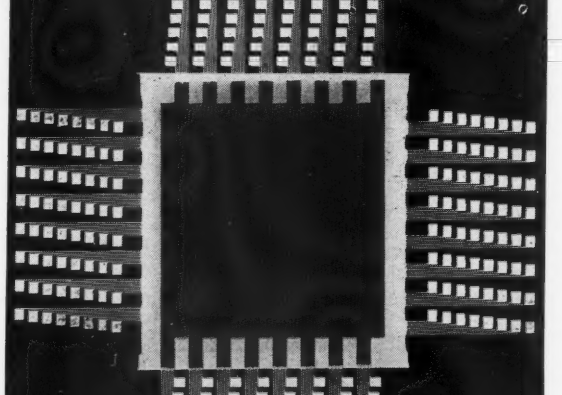


Fig. 2.—Prototype matrix

* Summary by the authors of their paper on "An Accurate Electroluminescent Graphical Output Unit for a Digital Computer" presented to the Institution of Electrical Engineers on 5th November.

ments on the average brightness of an E.L. cell indicate that the equation

$$B = a\epsilon^{-b/\sqrt{V}}$$

where B = brightness (integrated light output) for an applied voltage V.
V = peak-to-peak applied voltage.
a, b = constants for a certain phosphor at a particular frequency and voltage waveshape.

is accurate over a range of brightness levels as large as $10^8 : 1$ and it is shown that the discrimination ratio D of brightness levels generated by either V or $\frac{V}{2}$ volts is

$$D = \epsilon^{+0{\cdot}414b/\sqrt{V}}$$

A considerable improvement of this ratio is obtained if all unselected conductors of a co-ordinate set are subjected to an anti-phase voltage waveform of one-third the amplitude of the selected conductor. In this case all the unselected intersections are subject to a peak-to-peak amplitude of only $\frac{V}{3}$ volts. As an example, the discrimination ratio under typical operating conditions can be 600 for a V and $\frac{V}{2}$ system and 80,000 for a V and $\frac{V}{3}$ system, an improvement of over one hundred times.

The discrimination ratio is also affected by the frequency and waveshape of the applied voltage drive and an optimum frequency may be appropriately chosen. In operation the panel will be subjected to intermittent selection of various "spots" and this again has an effect on the ratio and requires the operating frequency to be high in order to minimise the deterioration of the discrimination.

A number of prototype 128×128 arrays have been produced and operated successfully and the resolution at 50 to the inch (80 to the inch in the larger panels) is excellent. Some difficulties have been experienced in coating the larger panels with a uniform layer of phosphor in plastic, but recent improvements in technique give more uniform coatings which allow the above discrimination ratios to be realised. It has been demonstrated that a panel of this type has sufficient resolution, discrimination, and brightness to allow at least 1,000 spots to be recorded in half a minute. It is hoped that this, together with the high accuracy and stability of the recording, will provide a useful ancillary equipment to the Mark II computer now being delivered to the department.

DIGITAL COMPUTERS

THREE papers relating to electronic digital computers were presented before the Measurement and Control Section of the Institution of Electrical Engineers on 5th November. The main features of one of these are given by the authors in the foregoing article on "Graphical Computers." A second paper, by Dr. M. V. Wilkes, Mr. W. Renwick and Dr. D. J. Wheeler (Cambridge University), is concerned with the design of the control unit, the function of which is to provide the sequence of pulses which, when applied to the store and to the arithmetic and other units of the machine, cause the orders of the programme to be executed. In one system described the order code is determined by the arrangement of diodes in a diode matrix. This scheme can be used economically for a simple order code, but if the code becomes elaborate including, for example, orders for floating-binary or floating-decimal operation, the number of diodes becomes inconveniently large.

To overcome this drawback a practical design was developed which would be applicable whatever the order code. This system, which is described in detail in the paper, is based on the use of matrices of ferrite cores with coincident-current selection. The voltage induced in an output wire when a core is returned to its normal position by bias current, after having been selected, must be greater than a certain minimum value. Also the break-through voltage induced in an input winding when a core which has been disturbed by one drive current only is returned to normal must be less than a certain maximum value. The magnitude of the break-through voltage determines the maximum number of cores on the same row or column which can be threaded by a given output winding. When a ferrite core is fully switched by a current pulse, the maximum rate of change of flux (or peak output voltage) increases with applied magneto-motive force; as a corollary, since the flux change in the core is constant, the switching time decreases.

Measurements made on every core of a small test matrix of 8×6 cores showed the break-through voltage from an unselected core to be less than 0·1 V per turn, whereas the output voltage from a selected core was 3 V per turn. The interval between switching successive cores was 1·5 microsec. Similar figures were indicated as obtainable with a complete matrix of 32×32 cores at the same speed. The conclusion was that cancellation of break-through signals is unnecessary, provided an upper limit can be placed on the number of times a given output winding threads cores on the same row or column.

Decimal Adder

The remaining paper, by Messrs. M. A. Maclean and D. Aspinall (Manchester University), had as its subject a decimal adder using a stored addition table by which numbers are accepted in binary-coded form. The binary digits, which are handled in parallel, are decoded into a set of pulses which actuate the built-in table. The circuits use square-loop magnetic cores for all logical functions and junction transistors as pulse amplifiers. An example of the advantage of decimal representation over binary numbers is found in a computer designed for data processing and having a high ratio of input-output time to computing time. The form of representation of decimal digits described by the authors is stated to allow the adder to be constructed as economically as one using bi-quinary coding but without internal carry.

Tests have shown the operation of the adder to be unaffected by repetition frequency, provided the basic timing period is at least 15 microsec, and to be satisfactory when bias current and collective voltage supplies are independently varied within ± 5 per cent. Simultaneous variation increased tolerances to 10 per cent, but this is not expected to cause difficulty, since voltage stabilisers using transistors can be built to supply relatively large currents with less than 5 per cent variation. About 80 transistors and slightly more than twice that number of magnetic cores were used in the construction of the

adder, its registers and the pulse-generation equipment. Speed of operation is at present limited to medium values by the transistors, but expected improvements in these should greatly extend the scope of the transistor core circuit. An adder having this type of number representation could be used with more conventional circuit techniques. It seems probable that an adder using diode matrices and valves could be operated at a speed at least ten times that possible with the transistor-core combination in its present stage of development.

Statement on Capital Investment Plans

A REDUCTION of 10 per cent in the investment programmes of the fuel and power industries, with the re-phasing of the nuclear power programme so that it will take a longer period to complete, was announced by Mr. Peter Thorneycroft, Chancellor of the Exchequer, when he explained to the House of Commons the Government's plan to hold down investment by public authorities to the 1957-58 level of £1,500 million a year in the next two years. The Chancellor said that even though prices rose, the £1,500 million would be adhered to.

First he looked at "the basis of an industrial society"—electricity, coal and gas. Next year, he said, they intended to spend about £450 million in this field and about £480 million in the year after. Next year's figure represented in real terms £170 million more than was spent in 1951. Four nuclear power stations were in hand and going ahead—at Bradwell, Berkeley, Hinkley Point and Hunterston. No other country was as far advanced in this field. In the coal industry they would invest £110 million next year and £120 million the year after. This would enable the National Coal Board to complete 40 major colliery schemes, to continue about 100, and start about 60 more during the period.

The programme in the power industries involved an overall reduction of nearly 10 per cent of what at one time was forecast or planned. It would mean the re-phasing of the nuclear power programme so that it would take perhaps nine or ten years to attain the potential planned for eight or nine years.

Expenditure on the roads—£100 million in the next two years, which was twice the rate of this year—would not be changed. Expenditure on the services of the British Transport Commission would be about £170 million in each of the next two years. This, while being a substantial increase on what was being done this year, did represent a slowing down of the rate of investment planned under the railway modernisation scheme, but it should not materially affect the advance of the railways to solvency. Post Office investment, which had been rising towards the £100 million a year mark, would be held at £95 million next year and £90 million the year after. The investment programme for technological education would not be altered.

In the private sector he had asked the banks to control money supplies by placing a limit on the amount that they provided. He knew the banks would do their best to finance exports and other purposes of high priority. The bankers' efforts would be supported by a request to the Capital Issues Committee to intensify its critical attitude to applications to borrow.

Mr. Harold Wilson, for the Opposition, said that the investment cuts would have a lasting effect on national productivity and our ability to compete in the world markets. Why, he asked, should they cut back essential public investment and refuse on doctrinaire grounds to cut back the quite inessential investment on vast office blocks and totally inessential factories producing goods for an artificial home market whipped up by television advertising? Now that the Government placed emphasis on European free trade they must realise that it was vitally necessary to convert this country into a high-investment economy.

Mr. Angus Maude considered that the approach of our entry into the European Free Trade Area made it essential that British industry should no longer be coddled into the belief that profits could be easily earned without matching increases in productivity and quality.

Mr. Mikardo declared that the Government had struck a damaging blow at the long-term prospects of the British export trade. It was bad enough when high rates pushed up the cost of equipment, he said, but it was much worse when they resulted in re-equipment not taking place at a time when our competitors were sharpening their weapons with every day that passed.

Mr. Douglas Houghton condemned the Government for picking on the nationalised industries for restrictions on capital investment. Workers in the nationalised industries must be treated as public servants and not made into catspaws in the new policy of wage restraints.

Sir John Barlow felt there would be many advantages if the capital investment in the nationalised industries were supervised and appropriated by the Capital Issues Committee as it supervised ordinary civilian issues.

Later, in answer to a question, Mr. Watkinson, Minister of Transport, said that although it would not now be possible to accelerate the railways modernisation programme in the next two years as much as had been planned, the programme was ahead of schedule and because of this the level of investment would not fall below that forecast in the White Paper on modernisation. There would be no delay in the fulfilment of the programme as a whole.

Scientific Policy

THE annual report of the Advisory Council on Scientific Policy for the year 1956-57, which has just been published by H.M. Stationery Office (Cmnd. 278), shows that the resources devoted to research and development for civil purposes in the United Kingdom are still far too small for the country's needs. The report expresses the hope that scientists and engineers rendered available through the defence cuts will be absorbed without delay into civil work, thereby producing some immediate improvement in the manpower position. It is also hoped that the major proportion of new science and engineering graduates coming forward now and in the future, and suitable for research and development work, will go into civil industry.

Although the universities employ a reasonable share of our available scientists and engineers in the national interest, the effectiveness of their research would be much enhanced by the comparatively small expenditure necessary to increase substantially the number of supporting staff in university laboratories.

The report welcomes the fact that the number of scientists and engineers obtaining full qualifications by way of admission to the professional institutions was higher in 1956 than in 1955. Although the number of students who took science or engineering degrees did not rise materially, the output of qualified men in 1956 was 11,685, a rise of about 6 per cent over the previous year's figure. Furthermore, the number of students entering science and technology departments of universities increased by about 20 per cent between 1954 and 1956. Now we must induce sufficient scientists to become teachers to ensure that the larger number of children who will enter secondary schools in 1958 will receive adequate grounding in mathematics and science.

SEMICONDUCTOR DEVICES

New B.T.H. Manufacturing Unit at Rugby

A NEW factory has recently been built at Rugby by the British Thomson-Houston Co., Ltd., to provide the best possible working conditions for the manufacture and development of high-power germanium and silicon semiconductor devices and the basic materials required in their construction.

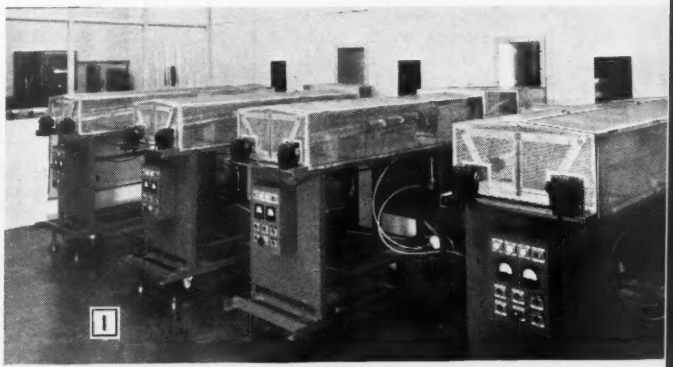
For the successful quantity production of semiconductor devices, it is essential that the highly specialised conditions of a development laboratory be reproduced at the production benches. The efficiency of the device depends primarily upon the initial purity of the germanium or silicon used for the rectifying element. Ideally, the impurity of the element should not be greater than one part in a thousand million. It is clear, therefore, that very special precautions must be taken throughout the manufacturing process to protect the materials from contamination by airborne dust and foreign matter in the normal industrial atmosphere. Additional precautions are also necessary to insulate many of the production operations from mechanical and thermal shock.

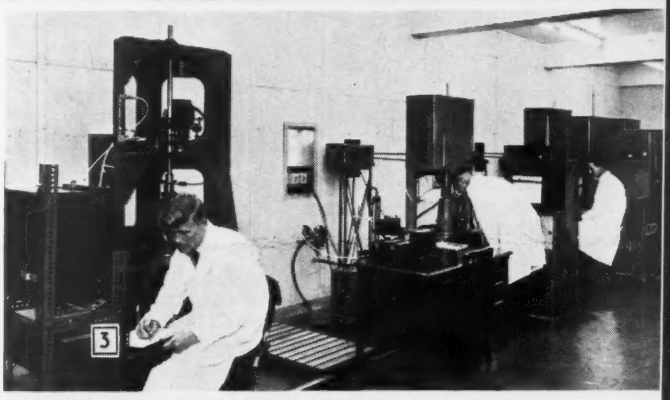
The new factory has two floors and contains a number of sealed-off working areas totalling 14,000 sq ft for the development and production of the devices. On the flat roof are erected the air conditioning plant, storage tanks for de-ionised water, and enclosures for the factory auxiliary services. An annexe extending along the whole length of one side of the building accommodates the power generators and heat producing plant, from which supplies are connected through panels in the walls to the main building. This arrangement simplifies the temperature control of the working areas and gives ready access to the equipment for maintenance and adjustment without the necessity for entering the sealed areas. On the other side of the building are situated the various containers for the gases used in the factory, supplies from which are piped to the working positions. About 70 per cent of the factory space is devoted to development and production of single-crystal material, including a chemical laboratory, stores, and office accommodation, while the remainder is used for producing rectifier cells under factory supervision.

Factory Services

In a factory of this kind where cleanliness is vital to safeguard the purity of the rectifying elements, special attention must be given to the air conditioning system and other essential services. Not only is the air entering the building filtered, washed, and heated to maintain automatically an even temperature throughout the factory, but the rate of change of air is also automatically controlled depending upon the temperature rise in the working areas. The air changes may thus vary between six and twenty-nine per hour.

Electrical power, de-ionised water, gases, and compressed air are piped behind panelling on each side of the building, outlets being arranged at intervals for connection to fume cupboards and working positions. Here





1. In this room, single-crystal material for semiconductor products is refined. 2. Cell production room, where semiconductor rectifier units are manufactured. 3. Production area, where single-crystal material is produced. 4. Development laboratory, showing the "dry-atmosphere" cabinets for the assembly of rectifier units

again, special precautions are taken in the distribution system to maintain the high purity of the water and gas supplies. A piped vacuum system is also provided to enable all working areas to be cleaned with the minimum of effort.

A rigid discipline is imposed on all personnel entering the working areas to prevent the ingress of foreign matter. In addition, local protection is provided in certain other areas which might otherwise become contaminated. During the relatively short time which the factory has been in operation this has resulted in an increase in both the quantity and quality of the output. Furthermore, the personnel has been educated to new standards of cleanliness which are so necessary for this specialised work. This education in cleanliness is of particular importance because, with the expanding production of existing products, many of the processes will later be transferred to more conventional factory buildings, highly mechanised but with local air conditioning, and therefore requiring at least the same, if not greater, precautions against contamination.

High-Power Rectifiers

Since the installation of the first high-power semiconductor rectifier, several larger units have been supplied to various customers. The rectifier cells are normally connected in a series-parallel arrangement on racks which fit into the cubicle. In operation, the cells are cooled by air drawn upwards over the cooling fins by an extraction fan mounted in a cowling at the top of the cubicle.

Equipments with ratings up to 18 MW have been designed by B.T.H. engineers, who have played a prominent part in the development, not only in equipment design, but also in the application of vigorous tests, first to individual cells and later to complete power rectifier equipments before they are passed for service. The testing, storage and assembly of the completed rectifier cells are carried out in a separate area adjacent to the semiconductor factory.

The Bases of Measurement

THE Sir Alfred Herbert Paper for 1957 of the Institution of Production Engineers was presented by Dr. H. Barrell, superintendent of the Metrology Division of the National Physical Laboratory, on 31st October. Taking "The Bases of Measurement" as his subject he gave an account of the fundamental standards of length, mass and time, with notes on their maintenance and improvement, special emphasis being laid on standards of length owing to their importance in production engineering. Of the standards for derived quantities in the mechanical system used by the production engineer, angle, force (or load) and hardness were discussed.

A standard of length might be represented by the distance between two parallel lines engraved on a material bar, called a line standard, or between two flat and parallel end surfaces, called an end standard. The defining lines on the bars for line standards for all important work were observed at the National Physical Laboratory through microscopes. Two more precise methods were, however, in course of development in one of which camera microscopes were used and magnified images were recorded on photomicrographs so that their position could be defined to an accuracy of 0·05μ (2 micro-inch) or better. In the other a photo-multiplier cell replaced the eye in a special design of microscope. The image of the defining line produced by the objective of this microscope was caused to oscillate across a slit in front of the cell and the consequent variation of its current was transformed electronically into an indication of the line position with a sensitivity of 0·02μ (0·8 micro-inch).

Such improvements should not, however, give rise to the impression that standards laboratories were concerned with degrees of accuracy too academic to be of interest to the production engineer. There was an increasing demand from industry for verification of its standards of length and angle to these accuracies, and the establishment of more precise standards of load and hardness was also a direct consequence of industrial requirements.

Modern Battery Railcars

THE replacement of steam by electric traction was being considered by many railways on lines where the traffic would be sufficient to cover the cost of substations and overhead equipment. Where these conditions were not fulfilled the steam locomotive would probably be steadily eliminated by diesel traction. In these circumstances, said Dr. Ing. G. Wilke in a paper read before the Institution of Locomotive Engineers on 23rd October, the old dream of employing electricity from storage batteries became more interesting, particularly as their capacity and life and the production of electric power increased. The latest development of such batteries allowed them to be used for railcars and favourable economic results were already obtainable with trains of one to three eight-wheel coaches.

German Experience

Experience over a number of years in Germany had recently led to the design of two types of battery motor-coaches, one of which was intended for use on main lines and the other for branch lines. Each type would be coupled to a trailer and the train could be driven from either end. Owing to the weight of the batteries the vehicles, which were equipped with two 100 kW motors, rode particularly smoothly and were usually operated at speeds up to 55 m.p.h. For short-distance traffic the scheduled speed was 40 m.p.h., exclusive of stops, which allowed the vehicles to be driven in such a way that much of the accelerating energy could be recovered by coasting. Sixty of these motor coaches and 44 trailers were now in service and a further 18 motor coaches and 23 trailers would be in operation by the end of the year. During 1957 the total mileage of these vehicles (together with that of 60 older vehicles) would have amounted to about six million miles. The total energy consumption would be about 17 million kWh. The greater part of this energy was supplied during the night and electricity together with the maintenance and renewal of the batteries, accounted for about 40 per cent of the annual cost.

Some Possible Improvements

Improvements in existing battery vehicles included the use of regenerative braking which would make it possible to work at moderately high speeds or to reduce the cost of power. One of the next developments might be a shunting locomotive with a maximum tractive effort of 22,000 lb, so that loads up to 500 tons could be handled and about 6,000 ton-miles of shunting service could be obtained from one charge. Improvements could also be expected in the present acid batteries by reducing the drop in capacity with the rate of current discharge either by better construction of the plates or by using regenerative braking.

VIEWS on the NEWS

By REFLECTOR

CURRENT discussions on street lighting standards—and there are always current discussions on this subject—make the issue of a revised edition of "Street Lighting Columns" opportune. This publication of the Council of Industrial Design (28, Haymarket, London, S.W.1) first appeared in 1954 and it lists under manufacturers' names a large number of columns which are of designs approved by the Council. The list costs 2s 6d (postage 6d). But good design is not everything, and it is emphasised in the introduction to the booklet that when it comes to siting the columns it is as well to consult the "amenity" societies.

In this connection the dispute about lighting standards at Richmond continues. At a joint meeting of the Highways Committee and ten representatives of protesting residents last week over eighty coloured slides of various kinds of street lighting were exhibited, including pictures of gas standards converted to electricity, an idea which seems to be favoured by the Richmond Society. It is obvious that, for the most part, gas street lighting is now definitely "period."

* * *

Surely this age must be more euphemism-ridden than the Victorian era. Spades are not even called agricultural implements nowadays. For instance, when Mr. Thorneycroft announced the Government's measures for dealing with the country's economic predicament he did not say that the nuclear power programme was being slowed down—it was being "re-phased." Similarly, prices are never increased; they are "revised," although if there is (a rare event) a movement in the other direction they are most definitely reduced. Deflation is a forbidden word; the proper term is "disinflation."

* * *

Last week I reproduced two replies from correspondents to a request for enlightenment about an 1887 patent for "Improvements in the application of electricity to spectacle frames" which I made in my notes of 25th October. In the same issue I referred to some remarks by Lord Goddard. Mr. L. W. Tomey (Sutton Coldfield) ingeniously suggests that the use of the invention is obvious—"to enable Lord Chief Justices to 'see a flow of electricity.'"

* * *

Scotland has achieved electrical independence of England and there are people in Wales who think that the Principality should also have its own separate Electricity Board. One argument adduced in favour of such an arrangement is that Wales already has its own separate Gas Board, but this is to ignore the vast difference between the natures of the two industries. Lord Mills, the Minister of Power, has replied to recent representations, explaining this difference. He has pointed out that the predominantly rural North Wales is logically combined with the urban areas of Merseyside and industrial South Wales with rural mid-Wales; there were no interconnections over the mountainous areas between north and south. The Herbert Committee said that a single Welsh distribution board might be *technically* practicable, although it rejected the idea on economic grounds.

* * *

As I pointed out recently, some newspapers inflate the capacity of power stations by expressing it in watts. Thus a 20 MW station, small by modern standards, can become a 20,000,000 watt station. Something similar has caught my eye in the *City Press* which recently said:

> "Enough power to keep a 50 watt lamp burning continuously for nearly 4,500 years! That is the fantastic amount of electricity generated during peak periods at the London Electricity Board's generating plants for the City of London."

The report goes on to say that "2,100,000 kilowatts are produced during this peak period but the generators gradually stop whirring until at about 4 o'clock in the morning they have virtually shuddered to a standstill and are only producing 400,000 kilowatts." Where are these power stations of the L.E.B.? They seem to be too big to be hidden in side streets. And is the Board thus anticipating Section 6 of the 1957 Act ("Generation of Electricity by Area Boards")?

* * *

Sixty years ago the *Electrical Review* reached its 25th anniversary and the issue of 12th November, 1897, was a special one with reviews of developments in the past twenty-five years by leading men in their respective fields. In surveying the subject of dynamo-electric machinery W. B. Esson pointed out that the celebration of the *Review's* silver jubilee coincided with the 25th anniversary of the Gramme dynamo "which made possible electrical engineering as known to the moderns." L. Epstein summarised the history of secondary batteries as:—

> "Expectations raised to the highest pitch and as frequently disappointed, rash and exaggerated statements, anticipations heralded as facts—on the other hand painstaking experiments, attention to the minutest details, resulting in steady progress."

In his review of electric lighting Sir Joseph Swan dismissed the great part played by himself and Edison in the following modest comment:—

> "The experimental work which had been actively carried on both here and in America since 1877, culminated in 1880 in the establishment of the incandescent lamp manufacture on a commercial basis, and on the same general lines along which it has, up to the present time, been developed and extended all over the world."

Sir James Swinburne, who happily is still with us, contributed a survey of transformer development.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

In our last issue we briefly reported the appointment of **Associate Professor A. Lee,** M.A., M.I.E.E., to a new Chair in Electrical Engineering (Radar and Telecommunications) at the Royal Military College of Science, Shrivenham. Professor Lee was educated at Todmorden Grammar School and at Emmanuel College, Cambridge, where he read mathematics and mechanical sciences. After a short period of research in industry and teaching at the R.A.F. Electrical Wireless School, Cranwell, he joined the College in 1935. He had been head of the radar and telecommunications branch at Cranwell since 1941, and he has been a member of a number of Government Committees connected with this subject.

Other appointments to the Royal Military College of Science are **Mr. A. Charlesby,** D.Sc., Ph.D.(Lond.), A.R.C.S., F.Inst.P., as Professor of Physics, and **Mr. A. D. S. Carter,** B.Sc., A.M.I.Mech.E., A.F.R.Ae.S., as Professor of Mechanical Engineering.

Mr. D. W. Stanley, who has been managing director of Metropolitan-Vickers South Africa (Pty.), Ltd., since 1948, is now also chairman of that company, having succeeded **Mr. A. L. Ohlson,** who retired from that office in June of this year.

Mr. D. W. Stanley

Mr. Stanley took a degree at Cambridge University, and went to M-V in 1927 as a college apprentice. In 1929 he joined the staff of the Export Company in London, and subsequently spent some time in Russia, Persia and Iraq on export business. He went to South Africa in 1946 as deputy manager of the Johannesburg office of the M-V Export Co., becoming managing director of Metropolitan-Vickers South Africa (Pty.), Ltd., in 1948, soon after its formation. In addition to being chairman and managing director of M-V South Africa, he is a director of First Electric Corporation of South Africa, Ltd., and chairman of Metropolitan-Vickers Central Africa (Pvt.), Ltd.

Mr. Ohlson joined British Westinghouse in 1916 from the Brush Co. and from 1917 was in charge of marine business, particularly geared turbines. In 1923 he was appointed manager of the newly-opened Johannesburg office of the M-V Export Co. He became chairman and managing director of Vickers & Metropolitan Carriage Co. (South Africa), Ltd., in 1933, holding these appointments until 1949. In 1947 he became chairman and managing director of the newly-formed Metropolitan-Vickers South Africa (Pty.), Ltd. Mr. Ohlson retains his directorship of First Electric Corporation of South Africa, Ltd., and he is also chairman of British Timken South Africa (Pty.), Ltd.

Mr. A. E. Marchant, M.Sc.Tech., M.I.E.E., A.M.I.Mech.E., who writes on the influence of the paper-making and printing industries on public electricity supply (page 831), is assistant chief commercial officer (planning and development) of the London Electricity Board. He received his technical education at the Victoria University of Manchester and was trained with the Lancashire Dynamo & Motor Co., Ltd., and the Manchester Corporation Electricity Department. Following post-graduate research on h.v. transmission problems he joined the Mid-Cheshire Electricity Supply Co., Ltd., in 1930 as assistant mains engineer and was appointed chief technical assistant to the Warrington Corporation Electricity Department in 1932, later also taking over the duties of consumers' engineer. Subsequently he became deputy and, in 1944, borough electrical engineer and manager at Barking. After being sub-area commercial officer from vesting date, he was promoted, in the same year, to his present position with the London Electricity Board. Mr. Marchant is a member of many committees within the industry and a contributor to the technical Press; he is a Freeman of the City of London.

Mr. A. E. Marchant

Mr. R. A. McMahon, in addition to his work as secretary of the Electrical Research Association, has taken over the function of laboratory management which has been relinquished by **Mr. W. S. Flight,** who is retiring at the end of the year. Mr. McMahon will in future be at the Cleeve Road Laboratory instead of at Thorncroft Manor. The Information Bureau has also been removed to Cleeve Road.

Mr. C. E. Payne, B.Sc.(Eng.), M.I.E.E., chief engineer and a director of the Ferguson Radio Corporation, Ltd., has been co-opted by Middlesex County Education Committee to the governing body of Enfield Technical College. Mr. Payne has for some time been closely associated with the College in connection with the educational and training schemes operated by Thorn Electrical Industries, Ltd.

Mr. J. R. Pheazey, vice-chairman and joint general manager of Standard Telephones & Cables, Ltd., has been honoured by the Japanese Government with the award of the Order of the Sacred Treasure (3rd Order of Merit) for the contribution which he and his company have made to the progressive development of telecommunications in Japan.

In announcing appointments to the new Electricity Council last week we stated that **Mr. W. B. Noddings** had been commercial manager of the Central Electricity Authority since nationalisation. Actually Mr. Noddings was appointed deputy commercial manager in 1948; he was appointed chief commercial officer at the beginning of 1956.

Mr. L. Bull, production director of Lec Refrigeration, Ltd., has been appointed joint managing director with **Mr. C. Purley,** the chairman, and **Mr. W. Gillett,** works manager, has been appointed to the board.

Vice-Admiral Sir Frank Mason, K.C.B., following his recent retirement as Engineer-in-Chief of the Fleet, has accepted a position as consultant to the management of the Metropolitan-Vickers Electrical Co., Ltd.

Lord Kershaw, O.B.E., J.P., has been appointed as an additional director of H. J. Baldwin & Co., Ltd.

Mr. J. R. Phillipson is relinquishing his business interests and has retired from the board of the British Vacuum Cleaner & Engineering Co., Ltd. **Mr. R. F. C. Booth,** A.M.I.C.E., has been appointed a director.

Oliver Pell Control, Ltd., announces that **Mr. A. Wilkinson** and **Mr. A. S. Mellanby** have been promoted to deputy sales managers in its technical sales organisation. Both have over twenty years' experience with the company. The appointments are designed to improve the liaison between

Mr. A. Wilkinson

Mr. A. S. Mellanby

the company and industrial concerns who use its services for the design and production of electro-magnets, relays, solenoids and special transformers.

At a recent meeting of the Council of the Institute of Public Relations, **Mr. G. A. T. Burdett,** of the British Thomson-Houston Co., Ltd., was appointed hon. programme director of the Institute. Mr. Burdett has been a member of the Institute since its inception nearly ten years ago.

Mr. G. A. M'Lennan, chief electrical engineer with Scottish Oils, Ltd., has retired after 47 years with the company and Mr. J. M. Caldwell, managing director, presented him with gifts on 30th October. Mr. M'Lennan entered the oil industry as an electrical engineer at Tarbrax and was appointed first chief electrical engineer of Scottish Oils in 1923. He did much to perfect flameproof electrical equipment and was responsible for the development of the electrical services in the Grangemouth refinery. He is a past president of the Association of Mining Electrical and Mechanical Engineers and is a member of the Flameproof Enclosures Committee of the Electrical Research Association.

The General Electric Co., Ltd., announces the appointment of **Mr. S. C. Sutton** as assistant manager of its London Sales Department. Mr. Sutton joined the G.E.C. in 1919 and served in many departments before joining the London Sales Department in 1936. He was manager of Luton depot from 1938 to 1943, when he was transferred to London. For the past seven years he has been responsible for all London sub-branches and depots.

Mr. S. C. Sutton

The attention of interested readers is drawn to the advertisement for a technical editorial assistant for the *Electrical Review* which appears in the "Situations Vacant" section of this issue.

Proposing the toast of the **Association of Supervising Electrical Engineers** at the dinner of the local branch at the Trent Bridge Hotel, West Bridgford, Nottingham, on 1st November, Mr. E. Houghton (head of the Department of Electrical Engineering, Nottingham and District Technical College) stressed the necessity for more full-time sandwich and day-release courses for the young technologist and engineer. Within the next ten or twenty years they must have more highly trained people in proportion to the untrained or partly trained. Mr. Houghton referred to the growth of automation, where men were served by machines, but added that the problem of man management had remained or become more difficult. He advised the Association to set very definite standards of entry.

Mr. O. F. Smith has been appointed manager of the portable electric tool division of the Stearn Electric Co., Ltd. He recently resigned from Black & Decker, Ltd., with whom he had been since 1926. The Stearn Electric Co. are wholesale distributors of all well-known makes of portable electric tools, and it is their intention to develop this department in the near future.

Mr. O. F. Smith

Mr. Harold Sutton, works controller at the Trafford Park works of Lancashire Dynamo & Crypto, Ltd., retired on 31st October, and to mark the occasion a presentation was made to him on behalf of his colleagues by Mr. A. W. A. Dick-Cleland, joint managing director of Lancashire Dynamo & Crypto, Ltd., who referred to Mr. Sutton's apprenticeship at the Trafford Park works and also his period of fourteen years at the Willesden works of the company. Mr. Dick-Cleland paid tribute to the many improvements in the production technique and output since Mr. Sutton's return to the Trafford Park works in 1942.

Mr. Alfred Padgham, the well-known golfer, was the speaker at last week's luncheon of the **Batti-Wallahs' Society.** His subject was "Ball and Club Making." Dr. L. G. Brazier, president, was in the chair. Mr. T. C. F. Bigland (the "Mate") announced that the next luncheon would be on Thursday, 28th November, and that the speaker would be Mr. J. R. Rylands.

At the annual general meeting of the **Electrical Trades' Commercial Travellers' Association** (Midlands Branch) held recently in Birmingham the following officers were elected for 1957-58:—Chairman: Mr. S. Le Marechal. Vice-chairman: Mr. T. C. Browne. Hon. secretary: Mr. S. W. Graefe. Hon. treasurer: Mr. G. A. James. General committee: Messrs. J. T. Aitken, G. W. Arnold, C. E. Davison, H. Hollies, P. J. Kelsey, P. M. King, F. C. Mealing, A. Rhodes, J. Tranter, J. Walker, S. E. Wilson and B. C. Winch.

At the annual dinner of **Rich & Pattison (B'ham), Ltd.,** recently held in Birmingham, nearly 150 members of the staff, their wives and friends of the company were present. In the course of a short speech, Mr. W. L. Rich thanked members of the staff and friends of the company for their loyal support during the past year and expressed confidence in the continued expansion of the company. The dinner was followed by a theatre party and a reception.

The annual dinner of the **Johnson & Phillips, Ltd., Foremen's Association** was held on 25th October at the works hall. Mr. F. G. Crichton, chairman of the Association, in proposing a toast to the company, referred to the retirement of Mr. G. Leslie Wates as chairman of the board and his appointment as honorary president of the company. He then read a message from Mr. Wates regretting his inability to be present but expressing his warm greetings, and taking the opportunity of publicly congratulating Mr. W. Glass on his election as chairman of the company. Mr. Crichton on behalf of the Association extended their congratulations and best wishes to Mr. Glass, who, in his reply, said he was confident that with his present team of directors the flag of J. & P. would be kept flying despite the difficult times through which they were passing. Mr. H. J. Olley, manager of the cable works, proposed the toast of the Association and said that there were 53 foremen with an average service of 30 years. Mr. J. Hayward, secretary of the Association, responded. The evening concluded with a cabaret.

The annual social gathering of the **Metropolitan-Vickers Long Service Association** was held in the staff canteen at the M-V Trafford Park Works on 28th October. About 1,100 members of the Association were present, all with thirty years' or more service with the company. Dr. C. Dannatt, managing director, addressed the gathering and the toast to the ladies was proposed by Mr. A. C. Main, director of manufacture.

OBITUARY

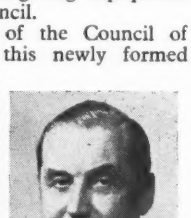
Professor F. Horton.—The death occurred on 31st October, at the age of seventy-nine, of Dr. Frank Horton, F.R.S., Emeritus Professor of Physics in the University of London. Professor Horton was well known for his work on the properties of quartz fibres at Birmingham University. Later, at Cambridge, he was associated with Sir Joseph Thomson and in 1914 he became Professor of Physics at the Royal Holloway College, London University, and engaged in research in electronics and X-rays. During the 1914-18 war he did important work in the study of the stability of emission in thermionic valves and he was elected a Fellow of the Royal Society in 1923 for research into the excitation potentials of gases.

Mr. R. O. Wright, who retired from the position of works manager of the Gravesend Works of W. T. Henley's Telegraph Works Co., Ltd., in 1936, died on 28th October; he was 86 years of age. Mr. Wright joined Henley's in 1898 and was appointed works manager at the commencement of the building of Gravesend Works in 1904.

New Lighting Council

As announced in our issue of 20th September the work of the Lighting Service Bureau is to be expanded under the auspices of a new governing body whose founder members are the British Electrical Development Association, the Electric Lamp Industry Council and the Lighting Equipment Development Council.

At a meeting of the Council of Management of this newly formed body on 30th October at the Institution of Electrical Engineers, the following officers were elected:— Chairman: Mr. D. Bellamy, O.B.E. (E.D.A.). Vice-chairmen: Messrs. W. T. Souter (L.E.D.C.) and A. E. Page (E.L.I.C.). Members of Council: Representing E.D.A.—Messrs. J. I. Bernard, W. N. C. Clinch, D. B. Irving, W. S. Lewis and W. B. Noddings. Representing the E.L.I.C.—Messrs. J. G. Christopher, J. Clement, W. J. Jones, C. J. W. Scott and H. C. White. Representing the L.E.D.C.—Dr. H. H. Ballin, Messrs. J. H. Campion, T. S. Jones, F. W. Norris and A. H. Young. Secretary: Mr. E. B. Sawyer.



Mr. D. Bellamy

Pending the acquisition of larger premises in a central position, the Lighting Service Bureau will continue to operate from its present address at Savoy Hill and through its area engineers in Birmingham, Glasgow, Leeds, Manchester and Newcastle.

Australian News

Detailed official statistics show that in the financial year ended 30th June, 1956, Australia had 332 power stations and works producing electricity—90 in Western Australia, 78 in New South Wales, 57 in Victoria, 57 in Queensland, 42 in South Australia, and 8 in Tasmania. Of these 157 were owned by local authorities, 111 by companies, and 64 were State-owned.

Employees numbered 12,111, and the annual salaries and wages bill amounted to £12·5 million. The average salary or wages per employee was £1,037. The total value of output was £84·8 million. Land and buildings were valued at £73·6 million and plant and machinery had a book value of £158·4 million.

Electricity sold totalled 13,787 million kWh (10,602 million Government, 1,785 million local authority, and 1,400 million company). Generation by States was: New South Wales, 6,505 million kWh; Victoria, 4,628 million; Queensland, 1,786 million; South Australia, 1,204 million; Western Australia, 753 million; and Tasmania, 1,794 million.

The main fuels used and their cost were as follows: 5,922,000 tons of black coal (£23·9 million); 6,517,000 tons of brown coal (£4·4 million); and 331,600 tons of brown coal briquettes (£1·5 million). Other fuels included coke, wood, fuel oil, fuel tar, gas and charcoal. Value of water and lubricating oils used was £556,744.

During the year additions to land and buildings cost £16·4 million, while additions and replacements to plant and machinery cost £19·5 million.

A 30 MW power station is to be established by the New South Wales Electricity Commission at Muswellbrook. The plant will comprise two 15 MW generators and associated boiler plant originally ordered by the Tamworth City Council for a power station at Gunnedah. Following an investigation by Ebasco Services Inc. of New York into electricity developments affecting the north and northwest of the State, the Commission decided to divert the generating plant to Muswellbrook, where better use could be made of the plant in relation to the needs of the State supply system as a whole. The boiler plant is being supplied by International Combustion Australia, Ltd., and the turbo-alternators by C. A. Parsons. A high voltage transmission line to Tamworth and Armidale will ultimately form part of the State's 330 kV transmission system.

EPPING-ONGAR ELECTRIC SERVICE

London Transport announces that an electric service will start on the six-mile outer section of the Central Line between Epping and Ongar on Monday, 18th November, replacing the present steam trains, and making the whole of the Central Line electrically operated. The change is being made to secure economy in operation and will save £20,000 a year. Two- and three-car electric shuttle services will be run, replacing the present two-coach steam trains.

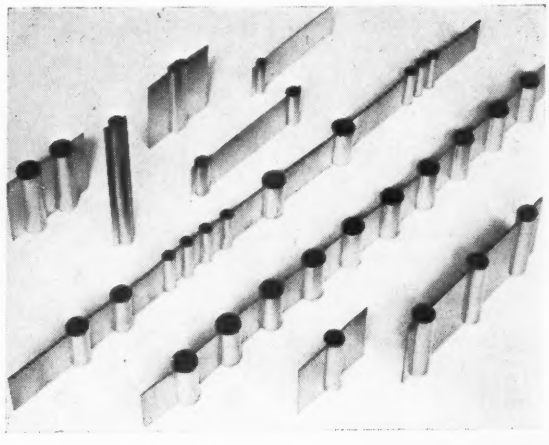
New Heat Transfer Material

A new material, "Tube-in-Strip," which has been added to the range of I.C.I. heat transfer products, provides a tube or a number of parallel tubes as an integral part of a sheet or strip of metal. At present it is made in copper and aluminium, but the range will later be extended to cover other non-ferrous metals. The material is at present supplied in the following size range:—Strip widths, copper up to 22in; aluminium up to 26in. Tube diameter ¼in to 1in. Minimum web between tubes ¼in. Total strip thickness: copper 0·01in to 0·125in; aluminium, 0·02in to 0·125in. Uninflated "Tube-in-Strip" is available in lengths up to 500ft depending upon the gauge of strip required. The metal is delivered to the customer as sheet or coiled strip and is inflated when required.

Many applications lie in the field of heat transfer.

There are certain conditions which suggest the advantages of using this material, such as where large radiant surfaces are needed, e.g. in water or steam heated radiators and solar energy absorbers. Where conventional tube diameters would be chosen to give a required external surface area but pressure drop considerations permit of smaller or fewer tubes being used, "Tube-in-Strip" may result in a smaller unit and in lower fabrication costs. Where tubes having a small thickness/diameter ratio are required, the cost of rolling to thin gauge may be less than that of drawing a tube to a corresponding wall thickness. In condensing of certain fluids such as refrigerants, the efficiency of the lower tubes in the condensers is reduced by the thicker films of liquid deposited by the upper bank of tubes. By suitably orientating the fins of the material, a controlled flow may be achieved, thus reducing interference effects between the tubes. This will improve efficiency and reduce fabrication costs, as there will be fewer tube ends to be fitted.

Sections of inflated "Tube-in-Strip"



PARLIAMENTARY REPORT

In an adjournment debate, Mr. John Macleod asked for information about the supply of electricity to Torridon, on the western seaboard of Ross-shire. He said that the people had gone to some expense to wire their houses and now the North of Scotland Hydro-Electric Board was demanding such extortionate capital charges that it amounted to a refusal to bring electricity to the area.

Mr. Niall Macpherson, Under Secretary, Scottish Office, replied that the cost of supplying Torridon was estimated to be in the region of £50,000. Potential customers numbered only about 130, although the number who would take the supply would be less. The average cost of supplying each customer would be £390. Even with the capital contribution from the consumer, the annual revenue could not be expected to equal the annual charges the Board would still have to meet. With the re-phasing of plans, he could not say what the delay in supplying the area would be.

Mr. J. Grimond said that all over the Highlands there was great anxiety because people had had their houses wired and had been told that the supply would come. Could they be told what the re-phasing of the programme would involve?

Mr. Macpherson said the Secretary of State was at present discussing the adjustment of the Board's plans to meet the Government's proposals on investments.

Windscale Accident

Questioned about the accident which happened in the No. 1 reactor at the Windscale atomic energy plant on 10th October, the Prime Minister said he hoped soon to be able to give a full report to the House. The Government were anxious to allay public anxiety, and would consider holding an independent inquiry.

Mr. Fort asked him if he could confirm that a similar accident could not occur in the types of reactor being built at Calder Hall and for the electricity authorities. "That, broadly speaking, is the case," Mr. Macmillan replied.

Later Mr. George Brown asked the Prime Minister to consider giving in his fuller statement a categorical assurance that what happened at Windscale could not in any circumstances happen at the C.E.A. stations. Mr. Macmillan said he would bear this in mind when he made his statement.

Restrictive Trade Practices

The Minister of State of the Board of Trade said in a written reply that the Board has made a second Order (the Registration of Restrictive Trading Agreements Order, 1957) requiring registration of restrictive trading agreements under the Restrictive Trade Practices Act, 1956.

The Order covers all agreements not covered by the first Order (the Registration of Restrictive Trading Agreements Order, 1956). If the Order receives the approval of Parliament, it will come into force on 31st December next. During the three months following that date particulars of the agreements covered by the Order must be furnished to the Registrar of Restrictive Trading Agreements. The agreements covered by the Order are, broadly, those which involve restrictions on the quantity or type of goods that may be produced or sold or which involve the division or sharing of markets or areas between suppliers. Agreements which affect exports but not the home market do not have to be registered. Under Section 31 of the Act they must, however, be notified to the Board of Trade. Copies of the Order may be obtained from H.M. Stationery Office, or through any bookseller; price 3d (by post 5d).

Sir Lynn Ungoed-Thomas asked the Attorney-General when the first case would be heard under Section 20 of the Restrictive Trade Practices Act.

Sir R. Manningham-Buller, the Attorney-General, replied that he was not yet able to say when the first case would be heard by the Restrictive Practices Court. Notices of reference had been issued in 25 cases and representation orders had been obtained in 18 of them. Two further applications for representation orders were before the High Court. In five cases, which were of a very complicated nature, the Registrar had granted extensions of time for delivery of the respondents' statement of case. In one case an application for a further extension was before the Court.

Technical Education

The Minister of Education (Mr. Geoffrey Lloyd) informed Mr. Albu that in 1955-56, the latest session for which figures were at present available, there were 454 full-time and 1,509 part-time courses in advanced science and technology in technical colleges in England and Wales. The numbers of students enrolled in the first and second years of courses for the Diploma in Technology in colleges in England and Wales were: First year, 532; second year, 291.

Telephone Cancellations

In reply to Mr. Ness Edwards, the Postmaster General (Mr. Marples) said that since the increased tariffs were announced in July 111,000 requests had been received for withdrawal of telephone service and 15,700 orders had been cancelled. By no means all of these had been due to the tariff changes, as was shown by the fact that in the corresponding period prior to the announcement there were 47,000 withdrawal notices and 14,300 cancellations of orders. Since the tariff announcement 85,000 new telephones had been installed.

Exports to China

Replying to a question by Viscount Elibank on engineering exports to China, Lord Mancroft, Minister Without Portfolia, said that the discussions taking place in the Paris Committee were confidential. He was therefore not able to disclose the tenor of the Committee's discussions on future quota arrangements, but the overriding consideration was the need for limiting strategic exports.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £197 0s 0d
COPPER, H.C. Electro	ton £187 5s 0d
Fire Refined 99·70%	ton £186 0s 0d
Fire Refined 99·50%	ton £185 0s 0d
COPPER Tubes ..	lb 1s 10½d
Sheet	ton £215 15s 0d
H.C. wire and strip ..	ton £241 15s 0d
LEAD, English ..	ton £84 12s 6d
Foreign	ton £83 0s 0d
MERCURY	flask £72 10s 0d
TIN, block (English) ..	ton £730 5s 0d
ZINC, G.O.B. Foreign	ton £67 10s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 1s 7⅛d
Sheet	ton —
Wire	lb 2s 4d
PHOSPHOR BRONZE Wire	lb 3s 7½d
PLATINUM	oz £31 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 23d—23¾d

Observations on Satellite

An additional meeting of the Radio and Telecommunication Section of the I.E.E. has been arranged to take place on Friday, 22nd November, when there will be a discussion on "Radio Observations on the Russian Satellite." A number of short contributions will be presented by members of the various establishments in this country who have been making observations. The subject will be divided into the following five sections:—Interferometer determinations; direction finding; Doppler determinations; signal characteristics; radar determinations.

The meeting will commence with an afternoon session from 2.30 to 4.30 p.m., to be followed by tea and an evening session starting at 5.30 p.m.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

A.S.E.E. Presidential Address

IN your report (1st November) of Sir Harold Bishop's second-year presidential address to the Association of Supervising Electrical Engineers, you refer to fundamental changes being brought about by the coming into force of new rules on 1st January, 1958. You appositely single out two of the changes which are of particular significance: the broadening of the basis of membership and the provision for the settlement of differences, both external and internal, by conciliation procedure rather than by other means.

The *Electrical Review* clearly shares the belief of my Association that these changes should encourage the acceleration of membership recruitment but—due doubtless to a typographical error overlooked at proof reading stage—refers to the admittance of " employees " having the requisite technical qualifications. It is, of course, the *employers* of the electrical and allied industries, as well as staff, who may be eligible to join the Association in the New Year, for any owner of a business or partner or other principal will be able to make application for membership. The Association's membership already includes such employers, as honorary members, who from 1st January, 1958, will be eligible for transfer to the appropriate grade or to associateship.

My Association will offer to employers and staff alike a friendly atmosphere, free of all " strings " and entirely devoid of all party or other politics, where all may work together for the common good; for the amicable settlement of any difficulty that may arise; and for the enjoyment of the technical, educational and social facilities which the A.S.E.E. is able and willing to provide.

London, W.C.1. E. A. BROMFIELD,
General Secretary,
Association of Supervising Electrical Engineers.

Capping of Fluorescent Tubes and Use of Low Voltage Lamps

AS electrical engineer in a company using large quantities of 5ft fluorescent tubes, I have found the b.c. lamps entirely satisfactory. On the other hand, the two-pin cap lamps on shorter tubes have given considerable trouble owing to poor lampholders and broken pins. The lamp makers are now giving publicity to adopting two-pin caps as a standard. Why not use b.c. caps as a standard for all tubes ?

The two-pin cap idea came from the U.S.A., where it was devised because they could not use their standard e.s. caps.

For years, to reduce the danger of high-voltage lighting, we have made low-voltage machine tool lighting a standard. This low-voltage lighting has been advocated by H.M. Electrical Inspectors of Factories for years, and I wish to register a public protest against the lamp makers for their action in putting up the price of low-voltage lamps from 2s 3d each, list, to 3s list, an increase for which there is no justification.

In order to get safe lighting, we have to buy step-down transformers and if the price of lamps is prohibitive, then people will be tempted to use high-voltage lighting, a step in the wrong direction for applications such as machine tools, etc.

Yeovil, Som. C. J. BENNETT,
Chartered Electrical Engineer.

Status of Engineers

BEING a member of the E.P.E.A. I would like to support the letter by " Engineer " in the *Electrical Review* of 25th October on this subject.

I contend that our Association is degrading its own status by still taking in new members who have no qualifications, except that they have been put into technical posts for reasons other than technical ability. I know of persons in the highest of positions who don't even know Ohm's Law, and others who were glorified clerks before nationalisation.

What looks more ridiculous than persons in technical and managerial positions not being able to discuss minor problems with prospective consumers, without first having to get advice from a technically-trained engineer ?

What incentive is there for technicians to come into this industry ?

" NORTHERNER."

Return to Competitive Tendering Urged

YOUNG civil engineers should seek experience overseas, Sir Arthur Whitaker told members of the Institution of Civil Engineers when he delivered his presidential address on Tuesday. " Work overseas brings added interest to an engineer and frequently affords a relatively greater degree of responsibility age for age than can be reached here." Sir Arthur, who was previously civil engineer-in-chief to the Admiralty and is now a partner in the firm of Livesey & Henderson, consulting engineers, went on to criticise both those engineers who shrank from responsibility and those who would not allow their juniors to assume a responsibility which was well within their capacity. The greatest limiting factor to our efforts at the present time was, however, the insufficiency of engineers to carry out the work to be done.

In conclusion, Sir Arthur urged the return to competitive tendering for contracts, since " the greatest efficiency is attained when open competition prevails." It would then be essential that schemes should be worked up fully before tendering was undertaken, and that the requirements to be fulfilled and the risks to be taken were defined as closely as possible.

INSTITUTE OF FUEL

THE Institute of Fuel has issued the 1957 edition of its alphabetical lists of corporate members and of various classes of non-corporate members. Information is also given on such matters as regulations for admission, examination requirements and educational and training facilities in fuel technology. Copies of the publication are available from the Institute at 18, Devonshire Street, Portland Place, London, W.1.

Domestic Consumer Survey

Further Examination of Appliance-Saturation Factors

IN 1946 a sampling survey of domestic electricity consumers was carried out under the direction of the Electrical Research Association. Undertakings supplying about one-third of all consumers in Great Britain took part, and data were collected regarding installed appliances, total consumption, etc. When the industry was nationalised this section of research work was taken over, and a Utilisation Research Committee was formed by the Central Authority and the Area Boards. A second survey was carried out under this Committee's direction in 1955 based on a random selection of one consumer in every thousand. The results of this survey have been described in two previous numbers of the *Electrical Review* (4th May, 1956, and 23rd August, 1957), and a third and final report has now been made available.

The chief object of both the 1946 and the 1955 surveys was to see what consuming appliances were installed in the sample visited and so to measure the average appliance-saturation factor, i.e. the percentage of consumers possessing one (or more) of each particular type of appliance. Annual consumptions were also recorded, and by a method of mathematical analysis the consumptions attributable to particular types of appliance have been deduced.

The latest report makes use of the same data as before, namely the 1955 survey, but it gives a more detailed classification of the results. Saturation factors are given separately for each type of appliance and are broken down into regions (north and south of England and Wales), type of meter (credit and prepayment), economic status, size of household, and number of rooms. In the last two cases separate figures are given for the north and the south. There are also tables giving the saturation factors of each appliance for consumers having stated annual consumptions and for consumers with stated combinations of appliances.

Review of Principal Trends

The results are difficult to summarise, but some of the more important trends can be illustrated graphically. The two figures which are reproduced have the same pair of vertical scales and the same lettering on the curves as indicated in the key below. The curve labelled "CON" refers to the total annual consumption according to the right-hand vertical scale, whilst all the other curves refer to the appliance-saturation factor as shown in the left-hand percentage scale.

Fig. 1 shows how appliance-saturation varies with economic status. The four classifications adopted are necessarily only rough, and it is impossible to guarantee that identical standards have been used by all the interviewers. Nevertheless, the results, particularly as regards the relative proportions, appear to be broadly acceptable. As would be expected, in almost all cases the ownership of electrical equipment has a strong positive correlation with income though there are considerable differences in the degree. Thus over the income gradient represented by the range from " pensioners " to " well-to-do " full-size cooker saturation rose from 9 to 36 per cent, water-heater saturation from 6 to 59 per cent, space heating from 33 to 95 per cent and refrigerators from 1 to 63 per cent. In fact the wash boiler appears to be the only appliance with anything approaching a negative income coefficient. Incidentally, the rising curve for television sets would seem to give the lie to the commonly held belief that the highest concentration of television aerials occurs over the roofs of working-class dwellings.

It is, of course, to be expected that the saturation curve will rise with income at a faster rate with luxury articles than it does with a comparative necessity such as a cooker. It is therefore more interesting to compare the curves for appliances which are in the same (" luxury ") class, e.g. television sets and refrigerators. Fig. 1 indicates that in " working-class " households there are nearly nine times as many television sets as there are refrigerators, whereas at the " well-to-do " level the positions are reversed, and in fact the refrigerator has almost as high a saturation as any class of appliance except space heaters and irons.

Using the same rough basis of economic status, the average annual consumption rose from 650 kWh to 5,470 kWh and the average annual bill from £6 to £27. (The latter is not shown in the graph.)

Fig. 2 shows the saturation factors of the same appliances, together with the mean annual consumptions, for different sizes of dwellings as measured by the number

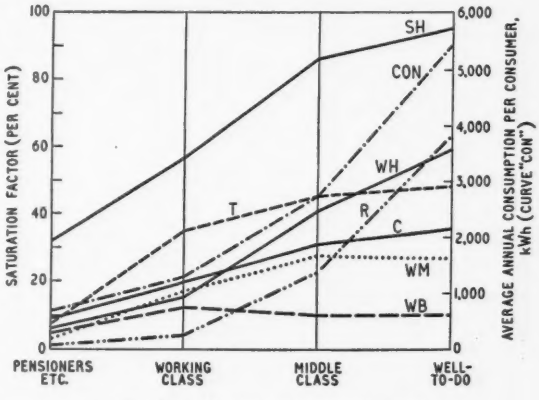


Fig. 1.—Variation with economic status

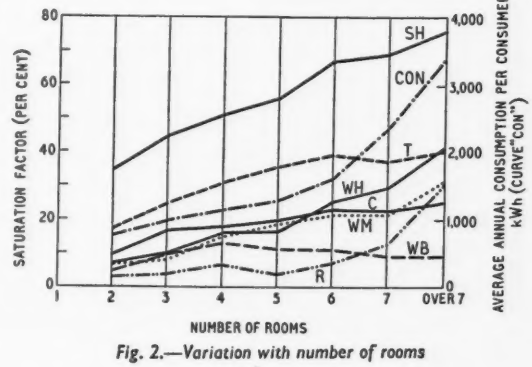


Fig. 2.—Variation with number of rooms

C. Full-size cooker. T. Television. WB. Wash boiler. R. Refrigerator. WH. Water heating. SH. Space heating. WM. Washing machine. CON. Average annual consumption

of rooms. These curves have a special interest in view of the fact that so many domestic tariffs employ a number-of-rooms basis. In almost all cases the saturation factor and also the mean consumption go up with number of rooms though, of course, less than proportionally. The only major exception is the wash boiler for which the saturation is highest with four-roomed dwellings.

In general, the correlation would appear to be considerably less strong than it is in relation to economic status. For example, for the range from two to seven rooms the saturation range was from 9 to 22 per cent for full-size cookers, from 7 to 30 per cent for water heating, and from 34 to 69 per cent for space heating. The annual consumption went up from 760 kWh to 2,300 kWh, and the average number of lamps went up from four to twelve. (The last is not shown on the graph.)

Separate figures are also given for rural consumers by themselves. They show that just half of these consumers have an electric cooker (full-size or breakfast type) as compared with 25 per cent for the average of all consumers. The water heater saturation, on the other hand, is lower than for the total of consumers.

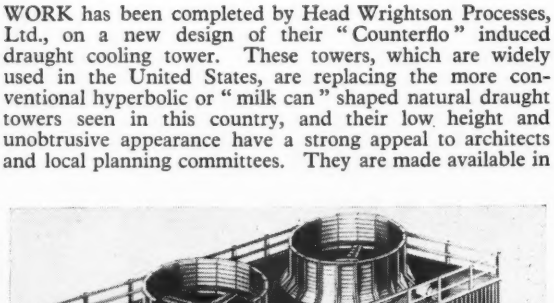
The report concludes with tables showing the build-up of the total installed load, annual consumption and annual bill. The table for the installed loads, reproduced above, shows that nearly half of all consumers have total installed loads of 3 kW or less. Only about 4 per cent have loads of over 15 kW. The table of mean consumptions shows that at the low-consumption end 33 per cent of consumers take 500 kWh or less a year, but this third of all consumers only account for 6·6 per cent of the total domestic consumption. At the high-consumption end only 15 per cent of consumers take over 3,000 kWh a year, but they account for 50 per cent of the total consumption. The disparity in size of bill is necessarily much less owing to the form taken by the normal domestic tariff. Some 28·5 per cent of consumers have annual bills of £5 or less and they account for 11·2 per cent of the total revenue. At the upper end 16·5 per cent of consumers have bills exceeding £15 a year and they contribute 40 per cent of the total revenue.

CONSUMERS AND THEIR INSTALLED LOAD

Installed Load	Proportion of Consumers	Cumulative Proportion
kW	%	%
Up to 1·0	17·2	17·2
1·1– 2·0	17·4	34·6
2·1– 3·0	12·2	46·8
3·1– 4·0	9·0	55·8
4·1– 5·0	5·9	61·7
5·1– 7·5	11·2	72·9
7·6–10·0	9·5	82·4
10·1–15·0	13·3	95·7
15·1–20·0	3·5	99·2
Over 20·0	0·8	100·0

New Design of Cooling Tower

WORK has been completed by Head Wrightson Processes, Ltd., on a new design of their "Counterflo" induced draught cooling tower. These towers, which are widely used in the United States, are replacing the more conventional hyperbolic or "milk can" shaped natural draught towers seen in this country, and their low height and unobtrusive appearance have a strong appeal to architects and local planning committees. They are made available in this country and the Commonwealth under licence from the Fluor Products Company, Los Angeles.



Artist's drawing of the new design of "Counterflo" induced draught cooling tower

Research into improved methods of industrial cooling has produced some novel design features for the water and air distribution in this new design of tower. The "Counterflo" tower can be composed of one or a number of cells each equipped with an induction fan which draws the air through the tower from louvre intakes. Water is distributed down the tower from a novel all-timber, but totally enclosed, distribution system through splash type grid decks, thus providing a counterflow action.

The tower is constructed of prefabricated timber or concrete units and these factory-made components can be erected on site by unskilled labour teams. A new feature is the inclusion of asbestos panels as sheathing for towers in certain circumstances. Erection of all types is rapid and simple and great flexibility is achieved in operation by individual cell control.

A.S.E.E. Diploma Scheme

THE Executive Council of the Association of Supervising Electrical Engineers announces that the 12th annual examinations to be held under the A.S.E.E. Diploma Scheme will take place at various centres throughout Great Britain on 20th, 21st and 22nd May next. The A.S.E.E. Diploma is awarded in electrical installation practice and in electrical maintenance. The syllabus for the A.S.E.E. technician's certificate allows selection of a specialist examination subject in the sphere in which technical experience has been gained. Technicians in the installation, design and layout, draughting, servicing, estimating, maintenance and consumer engineering fields of electrical work, among many others, are those who will find the specialisation section of the syllabus of particular interest. The last date for receipt of applications to sit the 1958 examinations is 1st March next. A folder giving details of the scheme can be obtained from the general secretary of the Association, 23, Bloomsbury Square, London, W.C.1.

The first of the five-storey blocks of flats is on the left with two of the eight-storey blocks under construction on the right

Electric Floor Warming at Reading

Work in Progress on 226 Flats and Maisonnettes

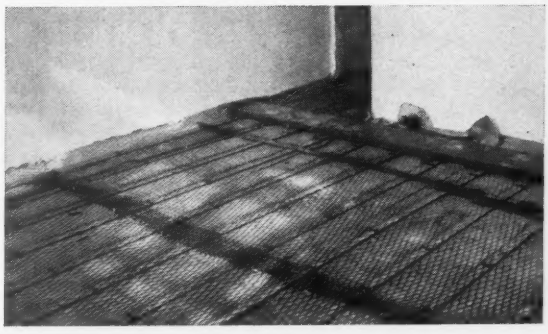
OFF-PEAK electric floor warming is being installed in 226 flats and maisonnettes now under construction on the western outskirts of Reading. The first five-storey block was occupied in the middle of last month and when the project is completed there will be six blocks of five storeys and four blocks of eight storeys. The smaller blocks contain two bed-sitting flats and one one-bedroomed flat on the ground floor, and seven two-bedroomed maisonnettes and one three-bedroomed maisonnette on the upper floors. The larger blocks are " Y " shaped with a central staircase and lift and contain 24 two-bedroomed and 16 one-bedroomed flats.

In each flat and maisonnette floor warming is provided only in the lounge, kitchen and hall. The loading varies with the size and position of the flat and in the five-storey blocks it is 3·76 kW for the maisonnettes, 3·73 kW for the one-bedroomed and 3·71 kW for the bed-sitting flats. In the eight-storey blocks the loading is 4·28 kW on the ground floor, 5·08 kW on the top floor and 3·9 kW on the intermediate floors. This is designed to maintain a temperature of 65 deg F in the lounge and of 55 deg F in the kitchen when the outside air is 30 deg F. The temperature of the surface of the floor does not normally exceed 75 deg F. Individual adjustment of temperature is provided by Satchwell thermostats mounted on the wall of the lounge and kitchen. A central time switch is provided to ensure that electricity is only taken between 7 p.m. and 7 a.m., and between 1 p.m. and 3.30 p.m. on Mondays to Fridays; electricity is available all day at the week-end.

A floor-warming installation is to a large extent self-regulating, since the amount of heat emitted from the floors and structure generally will depend on the ambient temperature. On a mild day the heat will remain stored in the floor and consequently less electricity will be taken during the following night. In these flats, this characteristic is supplemented by a Maclaren thermo-time regulator, which assesses the hours the installation needs to be switched on during the " off-peak " periods to " top-up " the mass of the floor, furniture, etc., to make good the losses of heat since the last charging period. For example, if a four-hour charge is required, the regulator may be arranged to switch on for one hour at 7 p.m. and then again from 4 a.m. to 7 a.m., so that the floor has the full quantity of heat to start the day. Socket outlets in the lounge and bedrooms enable electric fires to be used to provide additional heating as required.

The design of the buildings and arrangement of the floor-warming installation follows closely that employed in the pioneer flats at Kirkcaldy, Fife. The no-fines concrete method of construction developed by George Wimpey & Co., Ltd., who were the main contractors, has again been utilised and this provides a high degree of thermal insulation. The Panelec heating system consists of " U " shaped steel cable housings of " D " section which are laid on the top of the Fibreglass sound insulating blanket. Expanded metal is then bonded to the flat side of the housings to act as a heat diffuser and reinforcement for the 2in concrete screed. At one end of each room there is a trough to facilitate the drawing in, or withdrawal, of the heating cables and to accommodate the terminal boxes and supply cables. The arrangement of the cable housings, expanded metal and troughs in the living room and hall of one of the flats before the floor screed was laid is shown in the illustration. The floors

Cable housings, expanded metal and troughs in the living room and the hall of one of the flats before the concrete screed was laid



are finally finished with thermoplastic tiles. Additional floor coverings such as carpets do not affect the operation of the system.

In the five-storey blocks the supply for floor warming is taken from the main distribution box through an isolator and three single-phase meters to a three-phase contactor which is controlled by the time switch. Eleven separate rising mains in m.i. cable are then taken from a second distribution box to a switch-fuse box in each flat. Eleven rising mains, again in m.i. cable, are also taken from the incoming distribution board for the normal supplies for lighting, cooking and water heating and these are separately metered in each flat. In the eight-storey blocks the incoming supply cable is taken up the centre of the building to a distribution box on each floor. The supplies for floor warming are metered and controlled on each floor, while electricity used for lighting, cooking and water heating is again separately metered in each flat. There are two substations on the site, each of which contains an 11 kV / 415 V, 750 kVA transformer, a switch-fuse and two non-automatic oil switches. The maximum demand is estimated at 1,350 kVA, assuming that 40 per cent of the tenants have electric cookers. The total load for floor warming is 931 kW.

Electric floor warming and hot water supplied by immersion heaters in lagged hot-water tanks were adopted for these flats after a consideration of the cost of providing an equivalent service by other fuels. Taking into account not only the cost of the fuel but also the interest charges, maintenance and labour costs, the annual operating costs for the four eight-storey blocks are estimated at £8,000 with electricity, £10,000 with oil and £11,200 with coke.

The cost of installing floor warming in the lounge, hall and kitchen of the largest flat, with an area of 372 sq ft, is estimated at £131. The loading would be 5·08 kW and the running costs for a 30-week heating period would be £27 12s, or 10s 7½d per week spread over the year. Depending on the size of flat, the Council is proposing initially to add between 10s and 10s 10d per week to the rent throughout the year for heating, but this charge will be adjusted up or down in the light of experience. The cost of electricity for off-peak floor warming is at present 1·1155d/kWh.

Although the combined capital and running costs were naturally of prime importance, the borough architect, Mr. C. H. A. Willett, made it clear in an interview last week that they were not the only factors that had been taken into account. As he pointed out, 20 or 30 years might seem a long time to us but these buildings were built to last a hundred years and the Council had therefore aimed at providing facilities that would not be quickly obsolete.

Electricity was not only, in his opinion, the most convenient and efficient form of power, but it seemed likely that it would become steadily more plentiful and cheaper in relation to other fuels. More immediately, electricity was preferred from the point of view of cleanliness and health, and because no operating labour was required and maintenance was negligible. Floor warming was simple to install and it avoided the necessity for knocking holes in the structure which was inevitable with a conventional hot water heating system. There was also no painting of pipes and radiators. The reactions of the first tenants, particularly old people, had been most favourable and Mr. Willett was convinced that as a result of their experience and the reasonable charge, there would be a growing demand for this form of heating.

Although the present position is uncertain because of the financial situation, it is understood that consideration has already been given to the provision of electric floor warming in a further 567 flats to be built at Coley Park where a smokeless zone is planned. With the scheme already described and other smaller projects this would give a total off-peak load for floor warming in Reading of over 3,000 kW.

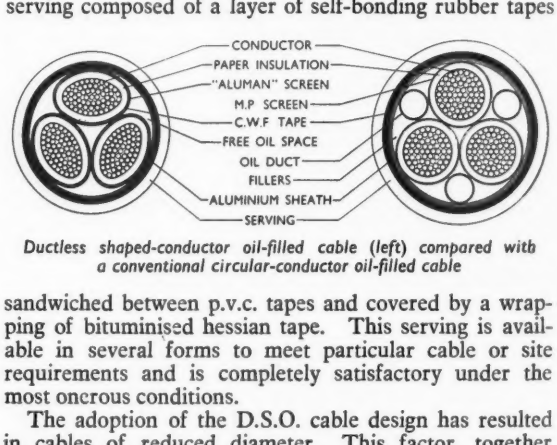
Our thanks are due to the officers of the Newbury Sub-Area and the Reading District of the Southern Electricity Board and the borough architect of Reading, for help in the preparation of this article. The electrical contractors were F. W. Sims & Co.

Shaped-Conductor Oil-Filled Cable

A 33 kV ductless, shaped-conductor oil-filled three-core cable (referred to as the D.S.O. cable) has been developed by British Insulated Callender's Cables, Ltd., together with a range of joints and terminations which have passed the British Electricity Boards' type test requirements. In this cable the main innovation is the introduction of shaped conductors such as are commonly employed in 33 kV solid type cables. It is the shaped cores which make a three-core ductless oil-filled cable possible, the free space between the cores being utilised for oil flow. Circular conductor oil-filled cables incorporate metallic spiral ducts for this purpose since they include paper fillers to give the sheath sufficient support to maintain its circular construction.

The D.S.O. cable is available with either copper or aluminium conductors over the range of sizes 0·20-0·60 sq in and either a lead sheath or seamless aluminium sheath may be supplied. When a lead sheath is used metallic tapes are applied over the sheath to enable it to withstand the internal oil pressure. The aluminium sheath requires no such reinforcement owing to its greater mechanical strength.

Anti-corrosion protection is achieved by an overall serving composed of a layer of self-bonding rubber tapes



Ductless shaped-conductor oil-filled cable (left) compared with a conventional circular-conductor oil-filled cable

sandwiched between p.v.c. tapes and covered by a wrapping of bituminised hessian tape. This serving is available in several forms to meet particular cable or site requirements and is completely satisfactory under the most onerous conditions.

The adoption of the D.S.O. cable design has resulted in cables of reduced diameter. This factor, together with the omission of built-in ducts and fillers and the lesser oil volume of the D.S.O. cable compared with the corresponding circular conductor cable, has naturally lowered the cost. The employment of an aluminium sheath, which requires no reinforcement, results, in general, in a still more economical oil-filled system.

The cable is designed to operate at a maximum conductor temperature of 85 deg C, this temperature having been the accepted standard for oil-filled cables in Great Britain for several years. The current ratings are similar to those of equivalent circular conductor oil-filled cables and are some 20 to 25 per cent greater than those of equivalent 33 kV solid cables.

Coal Gasification

Some Recent Developments and Future Prospects

A PAPER on "Recent Developments in Underground Gasification" was read before the North of England Institute of Mining and Mechanical Engineers by Mr. C. A. Masterman on 5th October. The paper might, said the author, be described as a continuation of the Blue Book,* which summarised the trials conducted in the United Kingdom during 1949-55. Since then attention had been focused on the "blind borehole" technique in which the borehole was drilled to a blind end and a tube of smaller diameter was inserted for nearly its full length. Air was then passed through this tube to supply a gasification reaction at the far end and the gas returned to the mouth of the borehole in the space between its wall and the tube. In passing over the air supply tube the gas transferred heat to the incoming air, which reached the place of reaction at 700 deg C or more.

This technique would be applied in practice by drilling a number of boreholes in the coal on both sides of a gallery, similar sets of holes being drilled from other parallel galleries. A shaft and heading had been provided for the current trials, the borehole being then drilled at an angle to enter the seam slightly uphill. The air tube, which was of high chromium-content iron, sleeved at the forward end with refractory tubes to give sufficient protection against excessive temperature and corrosion, was then inserted. A small tube carrying an electrically ignited firework at its forward end was also inserted, this being used to ignite propane or other gas and thus to start the reaction. At the gallery end the air tube was connected to a heat exchanger through which the incoming air was circulated as a temperature buffer between the hot outgoing gas and the adjacent coal. Complete instrumentation was provided on the surface.

Some Further Problems

Although the practicability and advantages of underground gasification by the blind borehole method had now been established beyond doubt, much remained to be done to determine the optimum conditions and lowest gas cost. For instance, the temperature of the air supply tube at the reaction end was liable to be very high. The inside was exposed to oxidising and the outside to reducing conditions, while mechanical stresses were imposed by thermal expansion and contraction. A possible and cheaper alternative to the present chromium-iron tube might be a continuous refractory pipe cast *in situ*. Water injection had been used to control excessive temperature rise, but was unattractive as a long-term method. An alternative was to bleed off a proportion of the gas from the reaction from a supplementary borehole. If the value of this "heat leak" method was confirmed these supplementary boreholes would take over part of the gasification and enable the main boreholes to be placed farther apart.

The present plan was to use boreholes about 100 yd long and 12in in diameter, with an internal air pipe 4in in diameter. These would operate initially at 10 lb/sq in with an air flow of 25,000 cu ft/hr. There was, however, nothing sacrosanct about the latter figure, and the optimum might be related to the wetness and thickness of the seam. The best spacing between boreholes and how many were best served by a single shaft would have to be decided as well as what safety barrier must be left between independent sections to ensure that there was no gas leakage between them. This would be facilitated by the intention to exhaust the gas from the gasifying system at slight negative pressures.

Use for Electricity Generation

The primary aim in the recent trials had been to maintain a desirable level of gas output. This was important owing to the need of the Central Electricity Authority to meet a fluctuating demand. If nuclear power provided 40 per cent of our electricity by 1975 and the overall load factor was 40 per cent, as at present, the 60 per cent balance of demand would represent under 30 per cent load factor. A flexible low cost output from underground gasification might then be a useful complementary source of supply.

The obvious use for gas produced by air with a calorific value of under 100 B.Th.U/cu ft was to generate electricity on site either in boilers or in gas engines or gas turbines. The last two might involve additional gas cleaning and the present intention was to employ boilers with a turbo-generator. The thermal efficiency was not likely to be more than 25 per cent, but the capital charges would be less, owing to the absence of coal and ash handling equipment. The gas quality was low for commercial use and further work was required on combustibility in relation to the design of burners and combustion chambers. In particular, the moisture content of the gas reduced the calorific value and partial dehydration might be necessary.

In conclusion the author gave some information regarding the 5 MW pilot system which is to be erected at Newman Spinney and of which a description has already been given in the *Electrical Review* of 18th November, 1955. Dealing with the design and estimated costs of a full-scale plant, he said that the annual gasification of 400,000 tons of coal to provide a continuous output of 60 MW would, it was estimated, cost 1¾d per therm, or 0·4d per kWh generated for base load. Even at under 50 per cent load factor this would still be cheaper than the 0·6d which was the estimated cost at base load from nuclear stations.

* British Trials in Underground Gasification. Code No. 41-134, H.M. Stationery Office.

European Hydro-Electric Potential

AS part of the activities of the Committee on Electric Power of the United Nations Economic Commission for Europe, a group of experts for the study of hydro-electric resources in Europe met at Geneva from 7th to 9th October, when the group adopted a provisional map showing in standardised form the distribution of hydro potential, showing stream flows and differences of elevation over a large area of the Continent. Since the scale of the map is 1 : 2,500,000, insets at a somewhat larger scale are to be included for particular areas where this is necessitated by the density of the isopleths.

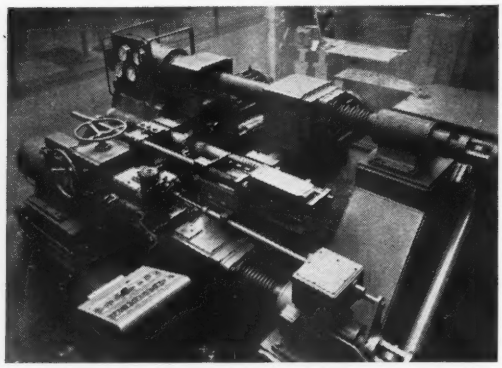
The group also continued its study of methods of determining net hydro-electric potential and of comparing gross and net potentials. The fact that a high proportion of the total hydro resources of such countries as the Federal Republic of Germany, Italy and Switzerland had already been developed was recognised as giving added interest for less developed countries to the correlation between theoretical and developed potentials in such cases.

NEW ELECTRICAL EQUIPMENT

Butt Welding

An automatic pressure butt welding machine recently built by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, 17, is intended for workshop use and is designed to produce high quality butt welds in low carbon and low alloy steel pipes from 3in bore by $\frac{3}{16}$in wall thickness up to 6$\frac{1}{2}$in bore by $\frac{1}{2}$in wall thickness. Joints can be made between pipe and pipe, and also between pipe and pipe flange by the use of a suitable adaptor plate. Welding times are from 45 sec up to 4 min, depending on the cross-sectional area of the pipe wall. The weld has a smooth, compact upset section, and the quality will readily meet test requirements for high pressure pipelines. It is the first commercial machine to be manufactured utilising a process developed by the British Admiralty for high quality butt welding of steel pipes.

The process consists of bringing the prepared faces of the pipe ends together under a minor load and heating the joint by means of a multi-jet oxy-acetylene oscillating ring burner until a pre-set thermal expansion is reached. A second higher, or control, load is then applied to return the pipe to its original length when the final upset load operates to complete the weld. All sequences are controlled automatically by limit switches which are also arranged to control the upset and to cut off the gas supply just before the completion of the weld. Post-heat treatment is required which consists of normalising for low carbon steel pipes, and normalising and tempering for low alloy steel pipes where air hardening tendencies are present. Straight normalising can be carried out in the machine.



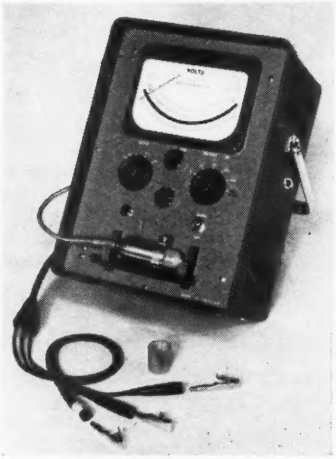
Metropolitan-Vickers automatic pressure butt welding machine for steel pipes

The operator's control desk, which is floor mounted, contains all the electrical controls required for the normal operation of the machine and also those associated with preliminary tests when changing over from one size of pipe to another. It also houses the special gas control and mixing unit and the gas flow indicators. The equipment requires a standard 380/440 V, three-phase a.c. supply for the 10 h.p. pump motor and control gear, a clean cold water supply of approximately 1 gal/min and an adequate supply of oxygen and acetylene gas. While this note deals with a machine for a specific range of tube sizes, Metropolitan-Vickers are prepared to supply designs modified to cater for welds in other ranges of tube sizes.

Vacuum Tube Voltmeter

A further advance on their vacuum tube voltmeter is announced by MARCONI INSTRUMENTS, LTD., St. Albans. The new model, type TF 1041A, is claimed to be the first British instrument of its kind with a frequency range extending to 1,000 Mc/s. For a.c. measurement, the frequency range extends from 20 c/s to no less than 1,000 Mc/s; input capacitance is 1·5 $\mu\mu$F, and input resistance is as high as 0·5 MΩ at 10 Mc/s and 150 kΩ at 100 Mc/s; the voltage range is 0·05 to 300 V. Balanced or unbalanced d.c. voltages can be measured up to 1,000 V at an input impedance of 40 MΩ balanced and 20 MΩ unbalanced. As an ohmmeter, the instrument measures resistance from 0·2 ohm to 500 MΩ.

For measuring a.c. potentials there is a specially-designed probe to make point contact with the source under test which weighs only 1$\frac{1}{2}$ oz—a factor that makes for ease of handling. A special plug-on ground connector is supplied for optional use with the probe unit; this connector facilitates the making of the ultra-short connections necessary at the higher frequencies. The d.c. section of the voltmeter is essentially a two-stage impedance convertor. Each stage embodies two cathode followers and there is heavy degeneration between the input points and the moving-coil meter across the output. For d.c. potentials there is, as well as a meter-reversing switch, a three-lead rubber moulding which can be fitted with either prods or crocodile clips.



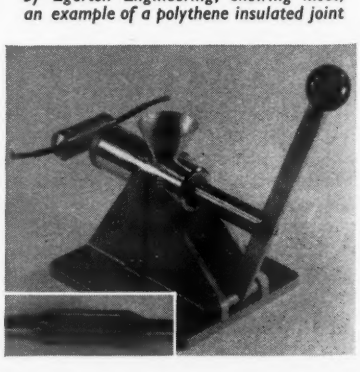
Marconi Instruments vacuum tube voltmeter, type TF 1041A

Three optional accessories still further increase the usefulness of the TF 1041A: d.c. voltages up to 30 kV can be measured with multiplier type TM 5033; the a.c. measurement range is extended to 2 kV using multiplier type TM 5032; for measuring voltages on a coaxial line there is a plug-on T-connector for attachment to the diode probe.

Insulating Multicore Cable Joints

A new method of providing watertight insulation for joints in multicore cables has recently been introduced by EGERTON ENGINEERING, 5, Nightingale Road, Petts Wood, Kent. The cable conductors are joined together in any orthodox manner and then a preformed polythene insert is placed between the various cores. The cable to be joined is then placed in a small mould and is injected with a thermoplastic, e.g. polythene, from a hand-operated portable injection moulder. This model, weighing approximately 9 lb, has been designed to accommodate all cable from $\frac{3}{16}$ to $\frac{1}{2}$in in dia., and from one to twelve cores, and its power loading is only 100 W.

Hand operated portable injection moulder by Egerton Engineering, showing inset, an example of a polythene insulated joint



Samples of joints finished by this process have been tested in humidity chambers, a three-core rubber covered cable taking 2,000 V for 29 hours in extreme humidity. This particular cable was then subjected to 17,000 V, when the rubber insulation broke down but left the joint intact.

By using different moulds, plastic sleeves can be formed over a cable at junctions with small plugs and sockets, such as coaxial plugs, etc. This greatly increases the strength of the cable where it is normally very weak. For smaller and single core cables a pistol type of jointer has been developed with equal success.

Industrial Filter Units

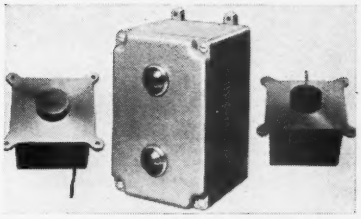
Filter units which will remove a high percentage of free moisture are now available in a wide range of sizes and materials for all industrial applications from AEROX, LTD., Lister Place, Glasgow, S.W.2. The illustration shows a unit employing the new Porsilex material which is an excellent water-repellent medium in the pressure range of 150-200 p.s.i. This material is known as SP 35 and it will free an air or gas stream of moisture and solid particles down to one micron in size.

Aerox filter with automatic drain tap

For the high rates of flow (say 100 c.f.m. free air) a slightly different type of element known as SP 28 may be fitted which will provide filtration down to ten microns.

Level Controller

A level controller which, it is claimed, overcomes the problems of limitation of cable length, inherent instability and indefinite on/off action associated with capacity devices has been developed by GORING KERR, LTD., Station Road, Gerrards Cross, Bucks. With this device any length of cable up to 300ft may be supplied for the linking of the probe(s) to the indicator unit. This is, of course, useful in cases where top level control in high containers is required, as it enables the indicator unit to be placed on a ground-level control panel.



Goring Kerr level controller showing indicator unit and "F" probe (left), "C" probe (right)

The controller, which comprises an indicator unit and one or two probes, is self-compensating for substantial deposits on the probes, is impervious to moisture deposits and will withstand wide temperature variations without the need for further adjustment. The "stick" probe known as type "C" is particularly suitable for powders which are adherent to the container walls, where large tanks are used and the powder level in the centre is higher than at the wall, the probe may be extended so that the active part is in the centre. A 2in diameter tube up to 6ft long is used for this purpose, and it is interposed between the probe box and the active element. In such cases the length of this extending tube must be stated before ordering. The flush probe known as type "F" is suitable for most liquids, granular substances and powders which do not leave a deposit on the tank wall of more than about 1 mm.

The indicator unit is housed in a cast aluminium box measuring 6½in by 9¾in by 6½in deep and weighs 10½ lb. The unit, when supplied with two probes, may be used as two independent level controllers, or may be arranged to control high and low levels in the same container. It is also available as a single level controller and timer, as an alternative to a double level controller: this "probe-timer" is for use with a tank of emptying time not greater than 45 seconds.

The instrument operates on any supply voltage from 200 to 250 V 50 c/s. Power consumption is 20 W and a failure to safety feature is incorporated.

"Octoflex" Wiring System

A system of wiring known as "Octoflex," which uses specially designed p.v.c. tubes and polythene or p.v.c. insulated conductors, has been introduced by HARTLEY ELECTROMOTIVES, LTD., "Octopus" Works, Monkmoor, Shrewsbury. It has been designed for use in flats, maisonettes, shops, offices or similar buildings where concrete or solid floors or roofs make a rewireable system essential.

Each conductor is housed in a separate tube, the two or three-way tubes in each cable run being attached by a p.v.c. web. Thus small-diameter tubes of mechanical strength equal to that of steel conduit are employed, and the conductors can be withdrawn easily

"Octoflex" wiring system for use in concrete or solid floors

if necessary. It is claimed that the tubes are non-rusting, non-scaling, unaffected by chemical action, sunlight or oils, and not subject to condensation.

Earth continuity cables, where required, are run in separate channels. The tubes are small enough to be installed in shallow screeds or run on walls in the normal plaster thickness, and the p.v.c. web makes a good fixing surface.

All tubes are cut by the makers to the lengths required and the cables are drawn into the tubes before delivery. They are supplied with all switch, socket and ceiling boxes, switches, socket outlets, pendants and consumer units (which can be to the customers' specifications), together with securing clips, fixing devices, etc. They are packed in two separate containers, for installation in successive stages, and are accompanied by the necessary drawings and instructions.

Earth Leakage Relay

The ELECTRICAL INSTRUMENT CO. (HILLINGTON), LTD., 47, Boswell Square, Hillington, Glasgow, S.W.2, has announced the development of a new earth leakage relay. It consists of a large robust moving coil movement, the pointer of which is made of a fine tube of magnetic material with an aluminium flag affixed to the end.

The operating current is fed to this relay from a current transformer usually having a ratio of 5 A/10 mA through a full wave rectifier. On reaching full scale deflection the pointer operates a make-or-break contact assisted and held in position by a small magnet. This position is shown by the red-coloured flag covering a small window in the instrument cover. The relays are tested to make or break 100 mA a.c. at 600 V. To release the pointer and reset the relay for operation, a knob projecting from the front of the case is rotated one complete turn.

INDUSTRIAL NEWS

Canadian Trade Mission's Visit

A Canadian Trade Mission will arrive in the United Kingdom on 22nd November and will return on 18th December. It will consist of upwards of fifty senior representatives of organisations normally interested in buying outside Canada, including officials of the Federal and Provincial Governments, and led by the Hon. Gordon Churchill, Minister of Trade and Commerce. The deputy leader will be Mr. J. S. Duncan, C.M.G., chairman of the Hydro-Electric Power Commission of Ontario and of the Dollar Sterling Trade Council.

The mission is an outcome of the recent talks in Canada between Canadian Ministers, the Chancellor of the Exchequer and the President of the Board of Trade. Arrangements for the Mission's programme are being made jointly by the Board of Trade and the Dollar Exports Council in conjunction with Canada House. The purpose of the Mission will be to assess the possibilities of generally increasing purchases from the United Kingdom and of obtaining from this country products which have previously been purchased elsewhere; it is concerned not only with immediate trading possibilities but also with the long-term expansion of Anglo-Canadian trade. It is therefore intended, in general, that the Mission should see the most outstanding industrial and technical achievements of the United Kingdom and that manufacturers in this country in particular should have an opportunity of demonstrating their capacity according to the particular interests expressed by the delegates.

Module Lighting System

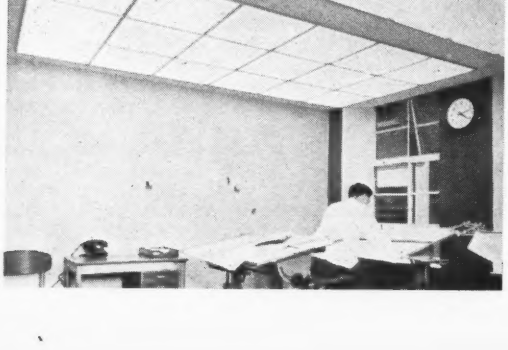
A new flexible form of lighting known as the "Lumenator" module system is being produced by Lumenated Ceilings, Ltd. It consists of a false ceiling of translucent plastic panels supported in an aluminium framework suspended below the lamp arrangement.

These panels diffuse the light evenly and without glare and look attractive even when the lights are switched off. Two standard types are available; one, moulded from vinyl plastics, has a decorative face in one of two patterns and the other, moulded from acrylic plastics, is completely plain. They will also be available shortly in colour.

The panels are each 2ft square and can be lifted out by hand for cleaning or to provide access to the lamps or other services. By incorporating panels of hardboard or acoustic tiles of a similar size in combination with the diffusing panels, the manufacturers claim that a wide variety of attractive layouts can be achieved.

The cost of this new system is approximately 10s per sq ft (excluding lights) for a large installation.

Demonstration installation of the "Lumenator" module lighting system produced by Lumenated Ceilings, Ltd.



Mechanical Resuscitator

A new portable mechanical resuscitator is now being marketed by the Medical Division of British Oxygen Gases, Ltd. The machine, known as the "Minuteman," weighs only 28 lb and can therefore be carried quickly to the scene of an accident. It can be used in confined spaces such as pit shafts, ambulances, or under debris. It can also be used for patients with fractured ribs where manual resuscitation may be dangerous.

The heart of the machine is a valve attached to a breathing mask which is held in the hand. The power which operates it comes from the pressure in an oxygen cylinder packed in the case. Its double action is automatically controlled by the patient's lung capacity. When a certain pressure has been reached, lung inflation stops automatically and suction then draws the used gases from the lungs. This action of sucking air from the lungs draws blood into them from the rest of the body, and so assists in the return of blood to the heart. A suction catheter attached to the machine can be used to clear obstructing mucus and froth. If necessary, the machine can be made to act as an inhaler, delivering oxygen-enriched air to a conscious patient. The resuscitator is designed for use in cases of gas and drug poisoning, drowning, electric shock, stroke, heart failure, etc., and has already been used extensively in America. We are informed that so far there are no records of the resuscitator being used in cases of electric shock. Unless it is instantly available, it should not be regarded as a substitute for accepted methods of resuscitation which can be applied immediately without the need for special apparatus.

Flying Showroom

Claimed to be Britain's first flying showroom, an Avro 19 plane left an airstrip adjoining the Bognor Regis factory of Lec Refrigeration, Ltd., on Monday of last week to begin a sales tour of the Middle East. At the controls was the well-known woman pilot, Mrs. Jackie Moggridge, accompanied by a co-pilot, Mr. George Farley, a former test pilot and now a Lec technician.

The company's export director, Mr. F. Purley, is also making the trip which will cover 15,000 miles and take six weeks to complete. The route to be followed will take in Rome, Malta, Egypt, the Sudan, the Rhodesias and Ghana.

Interior of the Lec Refrigeration showroom

Many of the seats have been removed from the plane to accommodate the refrigerators, which include the company's 6 cu ft "International" and a new baby model, the 2 cu ft "Coronet."

Siemens Edison Swan Birmingham Premises

The new premises of Siemens Edison Swan, Ltd., at 76-80, Sherlock Street, Birmingham, which were officially opened on 24th October, are the latest of a chain of regional offices established throughout the British Isles. The opening ceremony was performed by Mr. W. S. Lewis, chairman of the Midlands Electricity Board. The building, which has a floor area of approximately 20,000 sq ft, houses

The new Birmingham offices of Siemens Edison Swan, Ltd.

offices, showroom, warehouse, and a fully equipped maintenance workshop. Extensive parking space is available, and the warehouse section has been arranged to enable a further storey to be added, when expansion demands.

This depot will be responsible for the distribution of the company's products, maintaining stocks of all types of cables, lamps and lighting fittings, batteries, telephones, domestic appliances, cathode ray tubes, radio valves, radio components, wiring accessories, street lighting fittings, switchgear, etc,, whilst a staff of engineers will be on hand to deal with lighting, cable, and distribution equipment requirements, telephone maintenance, etc. In addition, the premises will, in the near future, also provide a battery charging station for supplying fully charged motor car starter batteries to the trade, and embody a maintenance workshop for the Siemens & General Electric Signal Co., Ltd.

British Computer Society

The British Computer Society, Ltd., was registered on 14th October as a company limited by guarantee without share capital. The original number of members is 2,000, each being liable for £1 in the event of winding up. Its objects are to take over the whole or any part of the business of an unincorporated association of the same name, etc. The management is vested in a Council, the first members of which include Mr. A. D. Booth, Mr. C. G. Holland-Martin and Mr. A. S. Douglas. The registered office is at Empire House, St. Martins-le-Grand, London, E.C.1. The secretary is at 29, Bury Street, St. James's, London, S.W.1 (telephone: Trafalgar 2810).

Electronic Reading Machine

The first production model of the Solartron electronic reading automaton is being purchased from Solartron Business Machines, Ltd., by Boots Pure Drug Co., Ltd., for installation at its head office at Nottingham. The task of the machine will be to read the sales records produced on rolls by the cash registers in the firm's branches.

The machine will convert the printed figures into electrical impulses and feed them direct to a special purpose electronic accumulator, which will print out the totals for accounting and statistical purposes. Certain of the figures will be used for cash control. Central processing of data recorded at the point of sale will make possible the use of relatively cheap and simple sales recorders and will also result in a substantial reduction of clerical work. The reading speed of the machine, 200/300 characters per second, will enable it to deal with rolls from hundreds of cash registers each week.

The machine's reading facility depends on photo-electric cells, which can be made to travel over the surface of a printed or typewritten figure in much the same way as the spot travels over the surface of a television tube. Information obtained in this way is analysed by an electronic computer which is so equipped as to identify the structure of the shapes of different letters and figures.

New Lister-Blackstone Company

A subsidiary company has been formed to handle the rail traction application of Lister and Blackstone diesel engines and other equipment manufactured by R. A. Lister & Co., Ltd., and Blackstone & Co., Ltd. The title of the new company is Lister Blackstone Rail Traction, Ltd., and its registered offices are at Imperial House, 15-19, Kingsway, W.C.2.

Ideal Home Exhibition

The *Daily Mail* Ideal Home Exhibition of 1958 will be held at Olympia from 4th to 29th March.

Nuclear Plant for Italy

An Italian company invited tenders on 30th October for the supply of a 150 MW nuclear power plant to be set up in Southern Italy with financial aid from the World Bank. The company, the National Electronuclear Society, in which the Italian Government holds a controlling interest, announced that interest had already been shown in building the plant by five British, ten American, two French, one Canadian and one Belgian-American companies. Tenders are to be submitted by 15th April next and it is hoped to complete construction of the plant in four years.—*Reuter.*

Ship's Cables

An order for the entire cable supply (16 miles in all) in the recently constructed M.S. *Katsina Palm* has now been fulfilled by Mersey Cable Works, Ltd. Two classes of lead-covered, fire resisting cable were provided, single core, varnished cambric insulated cable and multi-core, vulcanised rubber insulated cable. Installation work was carried out by Campbell & Isherwood, Ltd.

American Transformer Contracts

Reuter reports from New York that British firms were the lowest bidders on 30th October when the New York State Power Authority opened tenders for transformers for the Niagara power project.

The bids were for thirteen 18,000 kVA three-phase power transformers for the main plant of the project and were in three schedules: (1) For all thirteen transformers; (2) for seven transformers; and (3) for six transformers.

Ferranti Electric, Inc., was the lowest bidder on schedule (1), followed by the English Electric Export & Trading Co., Ltd., and the Westinghouse Electric Corporation, New York. Ferranti was the lowest bidder on schedule (2) and English Electric on schedule (3).

Electricians' Wage Claims

Application for an increase in wages was submitted to the Electrical Contractors' Association of Scotland on 31st October. A similar application for England and Wales was before the annual meeting of the National Joint Industrial Council for the Electrical Contracting Industry in London this week. The last settlement, in April last, provided for an increase of 2½d an hour, on the understanding that there should be a period of stability for twelve months.

Hillman Electric Motors New Factory

Hillman Electric Motors, Ltd., is now occupying its new factory at Crane Grove, Highbury, London, N.7. This move is the culmination of ten years' steady progress, during which the capacity of the old buildings became taxed to the limit. The new building

Assembling domestic sewing machine motors at the new factory of Hillman Electric Motors, Ltd.

has twice the floor area and will eventually enable the output to be increased threefold. Production lines are now established for the following range of products:—Food mixers, hair dryers, coffee mills and sewing machine motors for the home, industrial sewing machine motors, polishers and grinders, double grinders, universal motors, d.c. motors, three-phase motors, geared units and single-phase and capacitor motors for the workshop.

Simplex Conference

Electrical engineers and buyers from nearly every manufacturing company in Tube Investments, Ltd., attended a one-day conference and exhibition organised by the Simplex Electric Co., Ltd., at Oldbury on 29th October. Mr. F. W. Martin, chairman of the four electrical companies in the group, welcomed the visitors. Mr. J. D. Johnson, commercial director of Simplex, opened the conference and briefly reviewed the Simplex range of manufactures. He was followed by Mr. K. F. Cory, technical director of Power Centre, Ltd.; Mr. W. Millar, sales manager of Mersey Cable Works, Ltd.; and Mr. F. G. Arnott, director of Metallic Seamless Tube Co., Ltd., who each described the products manufactured and handled by their companies. After a buffet lunch, during which the visitors inspected an exhibition of representative items manufactured by the electrical division, the afternoon was devoted to talks and discussions on various products. The conference concluded with a showing of the film on the "Creda Debonair" spin-dryer. This was introduced by Mr. E. G. Plucknett, joint managing director of the Simplex Electric Co., Ltd.

Lamp Publicity

Three new additions have been made to the "Mazda" range of point of sale material. These are a mobile unit advertising "Mazda" car bulbs, a "camera and flash unit" folding display for use with packs of photo-flash bulbs and small conical lamp stands for window dressing and counters.

A new type of carton for electric light bulbs up to 200 W has been introduced by Atlas Lighting, Ltd. The new pack is an eight-sided cylinder notched to hold a collar on the neck of the lamp and is a complete departure from the conventional corrugated cardboard sleeve. Extensive tests have shown that this new form gives better protection than the old type, is easier to pack and is much more attractive in appearance.

Diesel-Electric Locomotives

The first of twenty 1,250 mixed-traffic diesel-electric locomotives which are being built by Brush Traction, Ltd., for British Railways Eastern Region was handed over last week to Sir Reginald Watson, acting on behalf of British Railways. These locomotives will be employed on the Great Eastern line at Stratford, near London, working freight trains within the Region and also operating to and from London, Tilbury and Southend. The remaining 19 locomotives will be produced and delivered at a rate of one every three weeks. All of the electrical equipment, including the generators, traction motors and control gear, is being manufactured by the Brush Electrical Engineering Co., Ltd., while the diesel engines are being supplied by Mirrlees, Bickerton & Day, Ltd.

Brush 1,250 h.p. mixed-traffic diesel-electric locomotive for the Eastern Region of British Railways

Equipment of Russian Satellite

Last Sunday the Soviet authorities' second artificial satellite was launched and it is now circling the earth in a period of about 1 hour 40 minutes. The satellite weighs 508 kg (about half a ton) and its equipment is said to include instruments for measuring solar radiation in the short-wave ultra-violet and X-ray parts of the spectrum, cosmic rays, temperature and pressure. It also contains a dog in an air-conditioned chamber and two radio transmitters operating at 40·002 and 20·005 kc/s.

A.E.I. Glasgow Exhibition

The A.E.I. Lamp & Lighting Company's latest lighting exhibition opened at their Glasgow showroom, 74, Waterloo Street, on 30th October. It deals primarily with "Mazda" lamps and fittings for industrial and commercial applications. Of special interest are the five suspended "space-frame" displays, each of which is devoted to a range of fittings—fluorescent, industrial, commercial, "Satina" and "shop and display."

The showroom annexe is devoted to an exhibition of ships' lighting, street lighting lanterns and trunking systems. The exhibition was designed by Robert Wetmore, M.S.I.A., in conjunction with the Publicity Department of the A.E.I. Lamp & Lighting Co.

Canadian Trade with Britain

Canada's wish to expand trade with Britain was emphasised last week in London by Mr. R. W. Bonner, Q.C., British Columbia's Attorney-General and Minister of Industrial Development, Trade and Commerce, who recently led a business delegation to Britain from his Province. At a luncheon of the Canadian Chamber of Commerce in Britain, he said that since the delegation's arrival they had placed orders with British industry worth $35 million (about £12,470,000). The policy of the Government and people of British Columbia was to develop trade with Britain to the fullest possible extent. Another member of the delegation, Mr. W. C. Mainwaring, vice-president of the British Columbia Power Corporation, whose company recently ordered four new turbines, said they had been highly pleased with the quality of the articles and machinery and equipment they had bought in Britain. They had found that British manufacturers took specifications seriously and carried out contracts to the letter. It was a pleasure to do business here.

Improvements in Mercury Discharge Lamps

It is announced by Crompton Parkinson, Ltd., that as a result of improvements in design and manufacturing technique it has been able to increase the life of its 250 W and 400 W mercury discharge lamps (type MA) by 25 per cent. This closely follows a similar increase which was announced recently in connection with the MBF/U range. With this latest development an average life of 5,000 hours is now claimed for all lamps throughout the entire mercury discharge range. Additionally, the figures already published relating to light output for a life of 4,000 hours are maintained for the new increased life performance. All prices remain unchanged.

Government Disposal of Zinc

In accordance with the programme of disposals announced on 2nd August the Board of Trade is to offer about 9,000 tons of zinc for delivery and pricing over the three months from December to February next. About 3,200 tons will be offered for sale by open competitive tender, and the remainder will be offered to the original suppliers or their agents.

India's Import Licensing Policy

Details of India's import licensing policy for the period October, 1957, to March, 1958, have been published in the *Board of Trade Journal*. The regulations governing imports from the soft currency areas follow much the same pattern as for the January-

June period and the procedure for the licensing of heavy electrical plant will continue in force subject to very strict control.

Apprenticeship in the Electrical Contracting Industry

We reported in our 18th October issue that the scheme of registration of apprentices in the electrical contracting industry initiated in 1950 and administered by the Apprenticeship and Training Council was to be terminated on 30th November.

An industrial correspondent says that on 15th March last the Minister of Works informed the National Federated Electrical Association and the Electrical Trades Union that the secretarial and registration staff provided by the Ministry would be withdrawn on 30th September. Representations by the Union and the Association succeeded in having the date of termination of the scheme deferred until 30th November. No further registrations of apprentices will be accepted after that date.

During the past two years, the N.F.E.A. has constantly pressed for a revision of the scheme on the ground (among others) that the educational provisions of the scheme were dependent on the implementation of the relevant sections of the 1944 Education Act; that, because of failure to implement these sections of the Act, the scheme was too expensive and placed a heavy burden on small contractors; and that now, with the withdrawal of the Ministry of Works from the scheme, it had become unworkable.

The Association has given six months' notice to terminate the scheme, as from 30th September. Meanwhile, a sub-committee of the Apprenticeship and Training Council is endeavouring to produce a scheme to ensure that apprentices registered with the Council before 30th November will continue to have available all the facilities of the national scheme.

New Switchgear Works Opened

The new Brackley Works of Switchgear & Equipment, Ltd., Banbury, which were described in our issue of 25th October, were formally opened by Councillor R. J. Staniforth, Mayor of Brackley, on Tuesday last week, and the opening was preceded by a luncheon at the Crown Hotel, Brackley, which was attended by a large gathering, over which Mr. A. G. H. Oxley, managing director, presided.

In an address of welcome, Mr. Oxley referred to the rapid development of the company from its small beginnings in 1932 and said that its turnover was now approaching £1,000,000. The new Brackley works were the first to be constructed there for a specific purpose. They had selected Brackley for the new works after considering other development areas, because suitable labour was available. There was plenty of room for future expansion and provided they could continue to get the labour they required future development would be in Brackley. They were held in high esteem in the industry and they could not make equipment fast enough; they were quoting twelve months delivery. Mr. Oxley thanked the Mayor and the Brackley Council for the help they had afforded the company. The new works would cost the company about £85,000. He paid a tribute to the workpeople and staff.

The Mayor said that young men in Brackley had been seeking suitable employment outside the borough, but with the opening of the new factory the opportunity was provided in the town for a career in a clean and staple industry. The Borough Council was prepared to give any assistance that the company might require.

Geneva "Atom" Exhibition

Concurrently with the Second Conference on the Peaceful Uses of Atomic Energy, sponsored by the United Nations Organisation and to be held in Geneva from 1st to 14th September, 1958, there will be a commercially organised international exhibition in the Palais des Expositions, Geneva. The Nuclear Energy Trade Associations' Conference (N.E.T.A.C.) is to co-ordinate the applications for space from the United Kingdom participants so that an impressive British section may be staged. The closing date for booking exhibition space is 20th November. Further information about the exhibition may be obtained from N.E.T.A.C. at 32, Victoria Street, London, S.W.1.

Works Visit

Members of the West London Branch of the A.S.E.E., with friends, visited the works at West Bromwich of Walsall Conduits, Ltd., on 16th October. They were met at Euston Station by Mr. E. Peacop (director); a dining car having been reserved for the party, breakfast was served during the journey to Dudley Port. A coach from there took them to the works where Mr. L. H. Butler (managing director) welcomed them. The visitors inspected the tube mills, where they witnessed the manufacture of electrically welded conduit, and the foundry to see the various raw materials, sand preparation and distribution plant. In the sheet steel shops they saw the manufacture of trunking. An inspection of the production of tubular heaters and "Walflect" lighting fittings followed. Visits were also paid to the Accessories Department.

Cuban Shipbuilding Project

A British consortium including the Brush Group, Ltd., James Burness & Sons, Ltd., and Higgs & Hill, Ltd., has agreed with Cuban interests on a £30 million project to build a shipyard in Cuba and 25 ships, it was announced in London on 31st October.

Trade Announcements

Herman Smith Smithlite, Ltd., has made the following appointments:—Mr. J. Wood, of Wood's Agencies, 375-377, St. Vincent Street, Glasgow, C.3, as their agent for Scotland and the county of Northumberland; Mr. G. Taylor, 40, Henley Street, Stratford-on-Avon, as representative for the counties of Worcestershire and Warwickshire; and Mr. D. Blashill, 44, Tettenhall Road, Wolverhampton, covering North Staffordshire and the counties of Shropshire and Herefordshire.

Abboflex, Ltd., has moved to a new factory in Walnut Tree Close, Guildford, Surrey (telephone: Guildford 5893). The new factory will enable the company to expand its range of flexible metallic tubing, flexible electric conduit and plastics sheathed tubing.

On 29th October the reconstructed Sheffield depot (Coburn Works, Tinsley) of **George Cohen Sons & Co., Ltd.,** was opened by Mr. Felix L. Levy, a director of the George Cohen 600 Group, Ltd., and a managing director of George Cohen Sons & Co., Ltd. The opening ceremony was followed in the evening by a dinner at the Grand Hotel, Sheffield.

R. B. Emerson, electrical contractors, have changed their name to R. B. Emerson, Ltd. The registered office is at 42, Summercourt Road, Southend-on-Sea, and the directors are Mr. R. B. Emerson and Mr. F. R. Emerson. Mr. D. Dixon is secretary.

Some of the members of the West London Branch of the A.S.E.E. at Walsall Conduits Works. The group includes Messrs. Noyes, Twentyman and White (A.S.E.E.), and Messrs. L. H. Butler (managing director), W. A. Millard, E. Peacop and Mr. N. Hoggins (directors)

NEW BOOKS

Factory Law. By H. Samuels, M.A. Sixth Edition. Pp. 734. Stevens & Sons, Ltd., 119 and 120, Chancery Lane, London, W.C.2. Price £4 10s.

The sixth edition of this classic work enhances the author's reputation for concentration on essentials. Factory managers and engineers, who may have occasion to look up a point of law, will be aided firstly by the comprehensive index and, secondly, by finding all the information on that point compactly arranged with references to other Acts, Regulations and decided cases which have a bearing on it. It is, however, necessary to learn how to read the references and it is not every factory executive who can interpret such formulæ as I.K.B. 385; 100 L.J.K.B.1; 143 L.T.650.

Many engineers glancing through this massive work may find some things they did not know before. Coal gas is held to be an " article," but electrical energy shares with a permanent hair wave the distinction of having something more ethereal, although eminently saleable. It might not, perhaps, occur to an electrical plant engineer that his maintenance workshop was not under the Factory Act, if situated under a separate roof, but it took a High Court case to determine that it was, and the pages of this essentially legal work show that in a profession dealing only with words, there is a wide field for ingenious misunderstanding.

The index links electric generating works with limewashing, which is in these days a little unkind, and there seems to be nothing new in the way of electrical case law, or as to whether a pole transformer constitutes " premises " and thus ranks as an " electrical station."

There is useful information as to the distinction between offices, drawing and designing rooms or research laboratories, which are not normally regarded as forming part of a factory, and such places as lavatories, cloakrooms and other accommodation used by the workpeople which therefore come under the Act.

No one who reads this treatise can fail to be impressed by the picture it conveys of the heavy and expensive responsibilities which are placed on organisations concerned with manufacture and production.—H.W.S.

Man and Automation. By L. Landon Goodman. Pp. 286; figs. Penguin Books, Ltd., Harmondsworth, Middx. Price 3s 6d.

Though pocket-sized, this book of fourteen chapters is a major work of some 100,000 words devoted exclusively to automation and underlying aspects. It takes an overall and general view with no specialist sections on specific branches of engineering science such as servo-mechanisms or electronic digital computers. Nevertheless, it is factual and down-to-earth. Divided into two parts, the technology of automation and the implications of automation, the book becomes of interest to a wide variety of readers. The author is well known for his articles and lectures, many of them aimed at the layman, on this and allied subjects. It is no surprise to find the style to be such as to interest the expert and the non-technical alike throughout the entire length.

The first part is concerned with engineering proper, starting with a general outline tracing the development of automation and bringing out the essential features of open loop manual control and closed loop automatic control. The author takes four basic components: mechanical handling, processing, sensing and control as the ingredients for automation, stressing that the idea " is only novel in that it extracts these four parts from a whole host of others . . ." to make automation possible.

The heart of the system, the machine tool, is dealt with next, considering transfer machines and analogue and digital computer control. Data processing, and automation in commerce, each have chapters devoted to them. Automation in industry covers a wide field from railways, through oil, chemical industries, building, food and electronics to " Tinker toy " production.

The second part of the book is perhaps the more important of the two. It deals with the implications of automation on all the various aspects of human endeavour from management to labour. The social and economic aspects are the main topics with a host of plain statements backed by facts and figures. The way in which questions of redundancy and workers' unions are handled should do much to alleviate existing distress brought about by ignorant and uninformed speculation.

Many other important issues are also raised; of special merit is the chapter on technological education. The book finishes with a chapter on the author's own observations, which forms a useful summary and a powerful conclusion.

The book, complete with an index, a dozen plates and about the same number of both diagrams and data tables, is essential to everyone who is interested, or ought to be interested, in this subject.—J.C.W.

Industrial Electronics Circuits. By R. Kretzmann. Pp. 174; figs. Philips' Technical Library, Cleaver-Hume Press, Ltd., 31, Wright's Lane, London, W.8. Price 35s.

This short and expensive book is intended to provide information on circuits which have been proved reliable in use, for industrial engineers and development technicians. There are six sections:—Photo-electrically controlled apparatus, counting circuits, stabilising circuits, contact and control devices, oscillator and amplifier circuits, and rectifier and motor control circuits.

The procedure adopted is to give a circuit diagram, a non-mathematical description of the operation, component values and often photographs from which the layout may be judged. The information thus provided is perfectly adequate to allow readers with only moderate technical knowledge to construct and operate the circuits described. However, if the characteristics of a circuit need adjustment to suit a particular application, the necessary relations will have to be found elsewhere. Another defect of this book is the natural but restrictive concern to boost Philips products. This is particularly evident in the counting sections which do not mention gas tube decade counters but concentrate on a special deflection tube, the E1T. For most purposes gas tubes do a better and cheaper job. American handbooks exhibit a praiseworthy catholicity in this respect and are to be preferred to the book under review.—A.H.B.

BOOKS RECEIVED

Advances in Nuclear Engineering. Vols. 1 and 2. Edited by John R. Dunning and Bruce R. Prentice. Pp. 523; figs. Pergamon Press Inc., 4 & 5, Fitzroy Square, London, W.1. Price £7 7s each volume.

Applied Electricity. By A. T. Starr, M.A., Ph.D., M.I.E.E. Pp. 502; figs. Sir Isaac Pitman & Sons, Ltd., Pitman House, Parker Street, Kingsway, London, W.C.2. Price 25s.

THE RADIOCHEMICAL CENTRE

EXTENSIONS OPENED BY THE MARQUIS OF SALISBURY

ON Friday last two new buildings were inaugurated at the Radiochemical Centre of the United Kingdom Atomic Energy Authority at Amersham, Bucks, by the Marquis of Salisbury, K.G., in the presence of Sir John Cockcroft. These buildings are a radiochemical laboratory and a block of offices. Their general purpose is to enable the Centre to meet the increasing demand for its radioactive products, which has more than trebled during the past three years.

The laboratory, which is a single-storey building of 12,000 sq ft, is the second part of a group of buildings specially designed for processing radio-isotopes, of which the first was commissioned in April, 1954. It will accommodate the same type of work: that is, the separation of pure radioactive isotopes from materials irradiated in the Authority's reactors, the synthesis of "labelled" compounds for research, and the manufacture of radiation sources for industrial and medical use. The scale of radioactive operations will be about a hundred times greater than previously.

The standards of radiological safety and control of radioactive contamination within the laboratory building are substantially higher than has been possible hitherto in this type of work, and conform to the most recent international recommendations. The laboratory is equipped with many special vacuum cabinets and much remote control equipment for handling radioactive substances. A group of "hot cells" is under construction which will allow handling of isotopes such as radiocaesium, emitting penetrating radiation up to 1,000 curies of activity. The cells are totally enclosed, shielded by some 3,000 tons of high density concrete, and equipped with the latest master-slave manipulators of British manufacture.

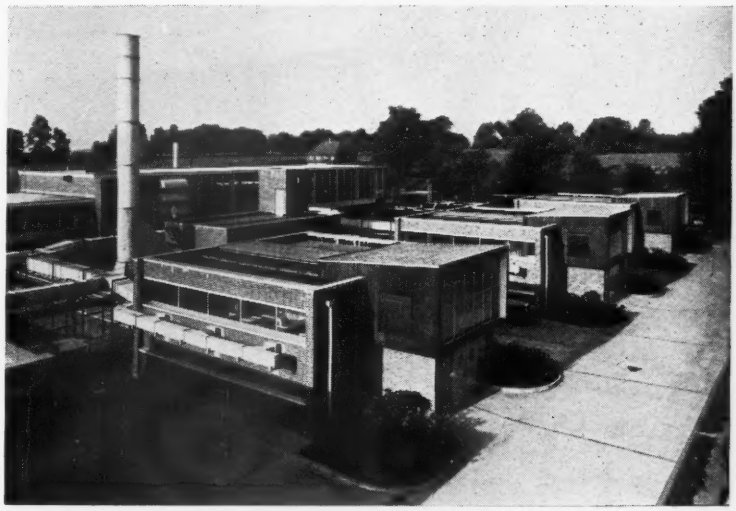
The administrative building has a floor area of 15,000 sq ft. The first floor houses the commercial department, which now deals annually with some 18,000 consignments of radio-isotopes exceeding £400,000 in sales value. Over 70 per cent of this total is exported and the products go to some fifty different countries throughout the world, mostly by air from London Airport. The ground floor of this building provides improved personnel facilities for the staff of two hundred.

The general principles behind the design of this new radiochemical laboratory are much the same as previously, but there are improvements in technique. The radioactive materials are strictly localised by being contained in vacuum cabinets with adequate shielding. To accommodate these units, there are two large open working areas which are provided with the usual services in modular groups at high level, a high standard of general ventilation and a separate drainage system to dispose of radioactive effluent. One of the areas is sufficiently large to accommodate a three ton gantry for handling heavy shielding and isotope containers. Ancillary rooms are provided for inactive or tracer level work.

The facilities for processing fission products at Amersham are being improved. Caesium-137 and strontium-90 have to be manufactured into the various special forms required by industry, as, for example, for industrial radiography. There is also need for producing increased quantities of the "minor" fission products—promethium, cerium-144, yttrium-91, zirconium and niobium-95, etc. For these purposes a "hot cave" facility is being constructed and is about half complete. It comprises three interconnecting compartments which can accommodate activities up to 1,000 curies of caesium-137. The shielding is 3ft of high density concrete bricks, vision is through windows containing concentrated zinc bromide solution, and for manipulation within the cells three pairs of the Argonne pattern of master-slave manipulators are being installed. These caves are intended for chemical work with highly toxic materials so they are provided with enclosed metal liners, each measuring about 7ft by 8ft by 15ft, which will be kept under slightly reduced pressure to prevent the escape of radioactive dust. This is the first time that these manipulators have been used for this class of work within caves which are not only fully shielded, but completely enclosed. Access to the caves when servicing is necessary, will be made by the "captive man suit" technique.

The demand for some of the less common isotopes has now grown sufficiently to warrant formal chemical plants for producing them and a system of standard boxes for working with fixed gloves or tongs is being installed. The boxes are transportable and interchangeable, they can be connected together to form larger units, and when in use they are tethered to the service mains by flexible connections. The transfer of processes from the more conventional laboratory fume hoods to this new system is necessarily protracted, as each one has to be specially devised and equipped, but some with sulphur-35 are already in operation.

General view of the laboratories showing the new block in the background



GENERATION and DEVELOPMENT

Planning Approval for Thurrock and Bradwell Works

Essex Planning Committee has considered an application from the Central Electricity Authority for permission to construct a generating station at West Thurrock and has approved the proposal, subject to satisfactory arrangements being made for public access along a strip of frontage land 100ft in depth and the carrying out by the Authority of a suitable scheme of landscape treatment.

The Committee has also granted permission for the construction of a 132 kV switching station and a 275/132 kV substation by the Central Electricity Authority at Bradwell-on-Sea in connection with the nuclear power station.

Objection to Overhead Line

Birmingham Corporation is objecting to the erection of an overhead electricity line on 90ft high towers across Woodgate Valley, in the city's green belt. The project is part of a proposed line from Bartley Green via Oldbury and Rowley Regis to Dudley.

Supply to Holy Island

The South of Scotland Electricity Board has completed a £17,000 scheme for supplying electricity to Holy Island, off the Northumberland coast. There are 170 people on the island. Electricity has been supplied to houses and other buildings, but street lighting is not planned at present. The island is supplied from the mainland by a submarine cable. The work was originally estimated to cost £12,000 but owing to delay in starting, due to opposition from various quarters, the cost rose to £17,000.

Hornsey Change-Over Completed

The last consumers receiving a d.c. supply in Hornsey were switched over to a.c. recently. A ceremony at the Service Centre, Crouch End, was attended by members of the Corporation and officers of the Council who have been associated with the development of the electricity supply in the borough, together with Mr. F. C. Orchard, the former chief electrical engineer and manager and now commercial officer of the Chilterns Sub-Area, Eastern Electricity Board.

Kent Village Supplies

Among the matters recently considered by the Kent District Committee of the South Eastern Electricity Consultative Council has been the supply of electricity to Barfreston, Frogham and Little Fredville. It was agreed that the project was one that the Board could not at present be recommended to proceed with. Although 42 of the 51 potential consumers had expressed a wish to take a supply only five required electricity for cooking, two for water heating and eight for a small amount of space heating. None had made any offer to contribute towards the capital cost of some £5,000 to which the Board would be committed.

Supply Reinforcement in North Devon

The South Western Electricity Board is planning to build a new 33 kV line from East Yelland power station via Braunton in order to provide an alternative supply to Ilfracombe. This will be followed by the construction of a high-voltage substation at Braunton to reinforce supplies over a wide area of North Devon.

New Essex Grid Point

A 132/33 kV substation for improving electricity supplies in the North Essex District was inaugurated recently by the chairman of the Braintree Urban District Council, Councillor F. Martin, at the invitation of Mr. R. W. J. Benyon, manager of the Essex Sub-Area of the Eastern Electricity Board. The substation is designed for an initial output of 90 MW. Extensions radiate from the new grid point at 33 kV to Dunmow and Saffron Walden and existing supply points at Braintree Local, Witham and Coggeshall have been similarly reinforced. Further extensions are planned for Wethersfield, Halstead and Stansted Mountfitchett.

OVERSEAS

Planning Power Development by Computer

In a matter of days an electronic computer at the Ferranti London Computing Centre has enabled the Swedish State Power Board to determine the best use of the country's hydro-electric power stations. There were dozens of possible alternative plans to be considered, and to examine each plan in detail took an engineer at least six weeks, and even then the problem had to be considerably simplified and therefore the results were not entirely realistic.

The main Swedish industries involved were the wood pulp, paper, steel, timber and river fishing. Some of the central problems were to calculate how efficient the present system of power distribution was among the industries in relation to their economic importance and to plan for the national development of future power stations.

The computer had to take into account such factors as winter ice, steam power production, water-level in the reservoirs, the capacity of dams and turbines, export of electricity to Denmark, needs of the major wood pulp, paper and steel industries, shipping and timber floating in the rivers. It even considered the amount of water needed by the salmon.

Rural Electrification in Uganda

Supplies of electricity have now been made available under the Uganda Electricity Board's first comprehensive development scheme. Costing £300,000, the scheme covers an area of 1,000 square miles in the Busoga district north of the township of Jinja —the site of the Owen Falls hydro-electric scheme. Some 68 miles of 33 kV line have already been erected to the main centres of population and subsidiary 11 kV lines are now under construction. About 1,000 consumers will be connected in the early stages and the Board expects a rapid expansion in the connection of new consumers now that there is visible evidence of the advantages of electricity.

Work has now started on four other comprehensive distribution schemes, involving a total capital expenditure of some £1,250,000. Two of these are centred on Kampala, the largest town in Uganda, and cover an area about 40 miles to the east, north and west of the town and one is in the foothills of Mount Elgon, near the Uganda/Kenya border. The electricity from these three schemes will be provided from Owen Falls. The fourth scheme is for Mbarara and the south supplied from the independent Mbarara hydro-electric scheme on the Kagera river on the Uganda/Tanganyika border.

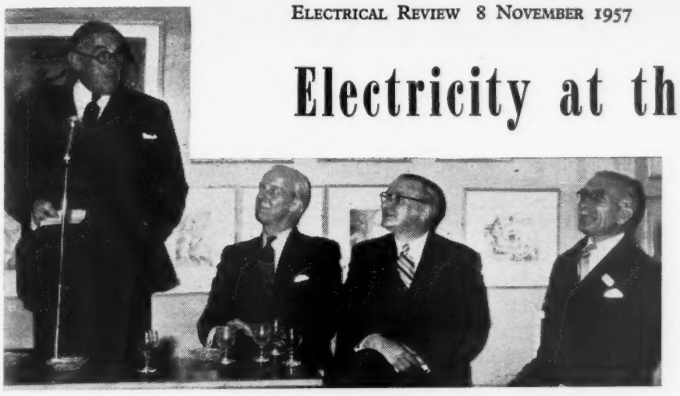
Japanese Reactor Test

A group of Japanese scientists working on tests of a model Calder Hall type reactor said last week that earthquake-proof equipment for a British reactor to be imported by Japan could be constructed at a lower cost than expected; the extra cost would be between 1 and 3 per cent of the total construction cost of the reactor.

Mr. Kenzabiro Takeyama, director of the research institute of the Construction Ministry, said that draft plans worked out separately by the group and by a sub-committee of the Japanese Atomic Energy Commission must first be discussed with British engineers.

The Japanese scientists made the announcement following statements that the British reactor was not suitable for Japan where there are many earthquakes. Mr. Takeyama said the model reactor tested was as small as one-eighth of the actual reactor and the results might be a little different from actual earthquake resistance in a big reactor. When the model reactor was given a shaking as strong as the 1923 earthquake in Japan the edges of the graphite blocks were damaged and cracks appeared between the blocks.

Electricity at the Building Centre



Lord Chandos introducing Sir John Maud (on his left) at the opening of the new Electrical Section. Next to Sir John Maud are Mr. W. S. Lewis (chairman, E.D.A. Council) and Mr. J. I. Bernard (director and secretary, E.D.A.)

DISPLAY FOR ARCHITECTS AND THE PUBLIC

A VERY bright, representative display of equipment has been arranged in the reconstructed Electrical Section at the Building Centre, Store Street (off Tottenham Court Road), London, W.C.1, which was opened on Thursday last week by Sir John Maud, Permanent Secretary to the Ministry of Power, deputising for Mr. Reginald Maudling (Paymaster General).

The section (for which the British Electrical Development Association is responsible) is conveniently situated on the first floor of the Building Centre. A prominently mounted block plan gives the visitor a bird's eye view of the arrangement of the equipment. As one important purpose is to interest the architect, the first subject treated is estate and building development, with stress on the need for adequate electrical services; early consultation between architects and Electricity Boards is recommended. Satisfactory consumers' services and installations are exemplified, introducing the ring main system and the use of light for illumination and decoration. The effects of various types of electric light are demonstrated.

Next comes an all-electric kitchen with ancillary displays of cookers, water heaters, space heaters, laundry appliances and refrigerators. Special attention is given in the commercial and industrial section to floor warming and thermal storage heaters and there is a selection of typical commercial catering equipment.

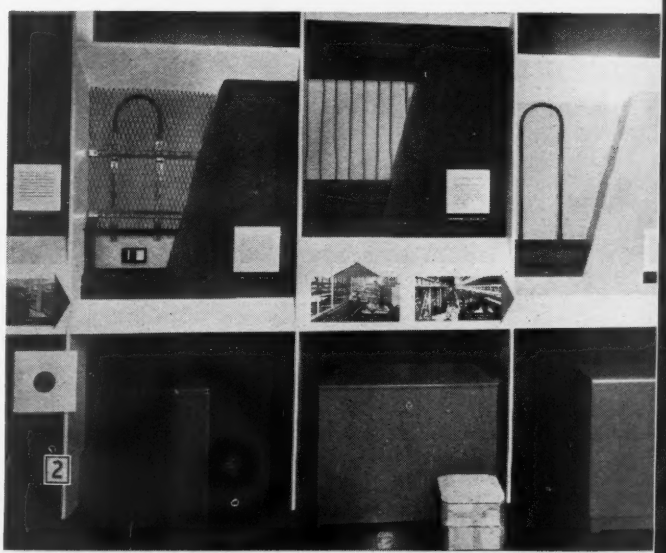
A pleasantly furnished lounge is provided where visitors can rest and talk to members of the staff. There is a good supply of " literature " on various appliances.

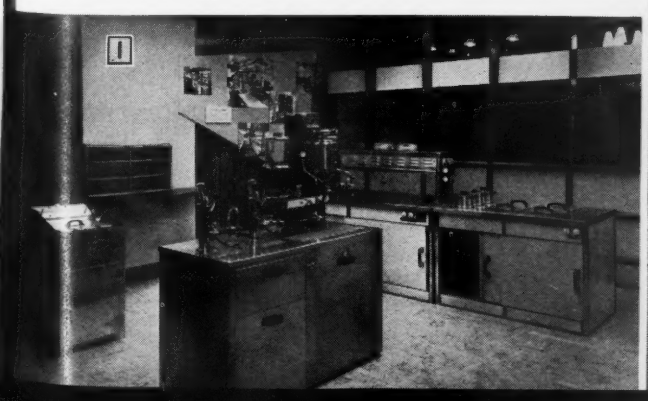
At the opening ceremony Sir John Maud was introduced by Viscount Chandos who, in the course of a brief and witty speech, said that the Electrical Section had been reconstructed at an opportune moment—when the profit margins of electrical manufacturers were getting very thin.

Sir John Maud commented on the presence of a number of architects, saying that it demonstrated the interdependence of the electrical industry and architecture, as well as representatives of builders and local authorities. Referring to the progress made by the electrical industry since the Building Centre opened twenty-five years ago, Sir John made special mention of the beautiful power stations which had been erected. He said that the appointment of Sir William Holford, F.R.I.B.A., as a part-time member of the new Central Electricity Generating Board was a guarantee that power stations would go on getting better.

As regards electricity in the home, Sir John thought that points should be installed in " enormous " numbers in every room; it was much more difficult to do this when the house was built and so architects should see to it in the first place.

Mr. G. Matthews, hon. treasurer of the R.I.B.A., thanked the electrical industry for the help which it gave to architects. Electricity was so complex that it " foxed " architects and so they needed all the help (as exemplified in the present display) that they could get.





1. Commercial catering equipment. 2. Floor warming and thermal storage heating. 3. Part of the all-electric kitchen

DOMESTIC ELECTRICAL EQUIPMENT

THERMAL STORAGE WATER HEATERS

FROM the dozen or so manufacturers of electric thermal storage water heaters in the following survey, models are obtainable to meet all domestic needs, ranging from the 1½ gal sink water heater to the larger dual-purpose models in 20 and 30 gal sizes. It is the smaller 1½ to 3 gal non-pressure types which are most in demand for meeting the everyday hot water requirements in the kitchen.

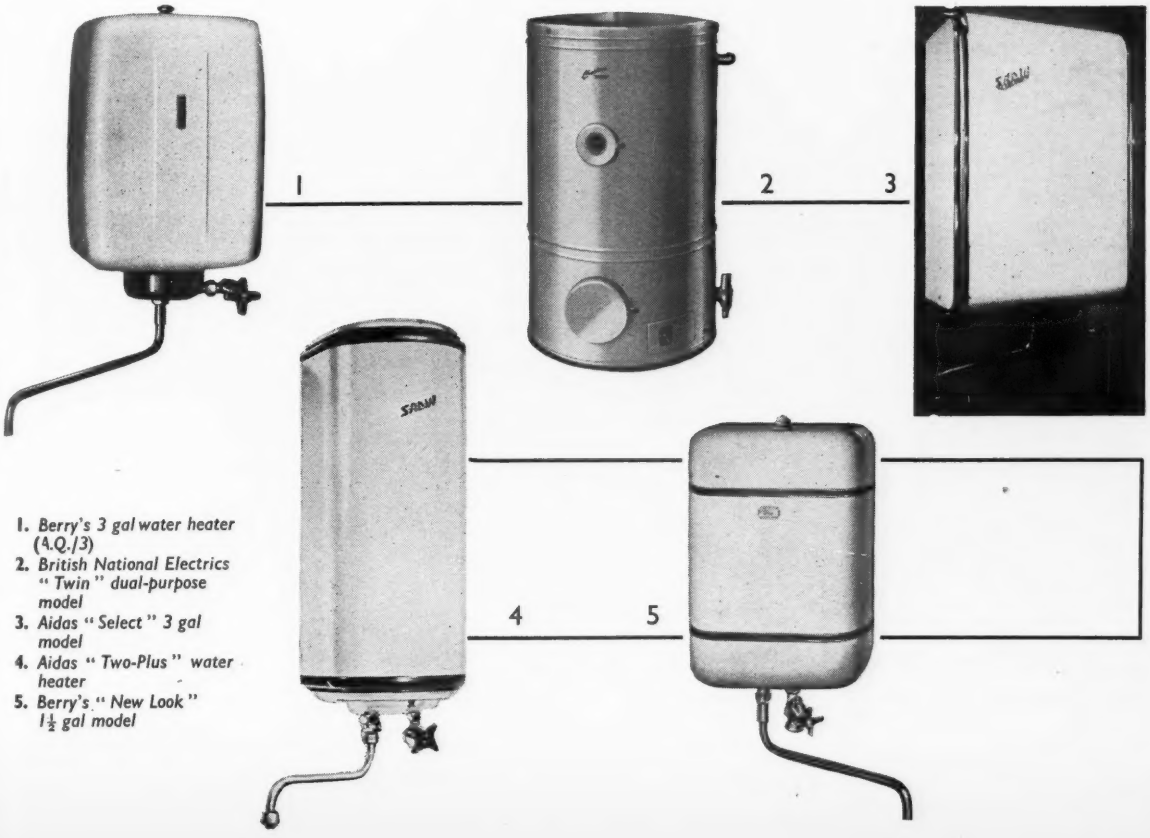
The running costs bear favourable comparison with other forms of water heating for similar purposes. The majority of models are designed for direct connection to the mains water supply, control being by a valve on the inlet side. They are usually arranged for wall mounting and fitted with a swing-arm outlet. Many of the latest water heaters are now rectangular in shape and are designed for fitting flush to the wall.

The large pressure type heaters are supplied with cold water from the storage tank and cannot be connected direct to the water mains. They can also work in conjunction with a fuel-fired domestic boiler, being used as an additional hot water storage tank during the winter months and operated entirely by electricity in the warmer weather.

In addition to white and cream, which have for many years been the accepted finishes for this type of appliance, more models are now available in colour. The latest G.E.C. "Superspeed" 2 gal heater has, for example, a choice of coloured bands in "House and Garden" colours, while the Jackson "Jill" heaters, introduced since our last survey on this subject, have a choice of cover plates in turquoise blue or eau-de-nil. Berry's range is available in green and blue in addition to white and cream.

Manufacturer	Name or Model	Type	Capacity	Loading	Finish	Price (excl. tax)	Purchase Tax
AIDAS ELECTRIC, LTD., Sadia Works, Rowdell Road, Northolt, Greenford, Middlesex.	G	Wall mounting, free outlet	1½ gal	750 W	White or cream with coloured bands	£10 10 0	£4 18 4
	"Two-Plus"	Wall mounting, free outlet	2·2 gal	1 kW	White or cream with chromium mouldings	£11 0 0	£5 3 0
	H	Wall mounting, free outlet	3 gal	1 kW	White or cream with coloured bands	£12 0 0	£5 12 4
	"Select"	Rectangular wall mounting, free outlet	3 gal	1 kW	Various colours with chromium mouldings	£13 10 0	£6 6 5
	U.T.C.	Wall mounting, pressure	3 gal	1½ kW	White or cream with coloured bands	£12 12 0	£5 18 0
	U.T.C.	Floor mounting, pressure	3 gal	1½ kW	White or cream with coloured bands	£13 2 0	£6 2 8
	B	Wall mounting, free outlet (A) or pressure (B)	5 gal	1 kW	White or cream with coloured bands	£17 0 0 (A) £16 0 0 (B)	£7 19 2 (A) £7 9 10 (B)
	L	Wall mounting, free outlet (A) or pressure (B)	7½ gal	1 kW	White or cream with coloured bands	£19 0 0 (A) £18 0 0 (B)	£8 17 11 (A) £8 8 6 (B)
	C	Wall mounting, free outlet (A) or pressure (B)	12 gal	1 or 1½ kW	White or cream with coloured bands	£23 10 0 (A) £22 10 0 (B)	£11 0 0 (A) £10 10 8 (B)
	D	Wall mounting, free outlet (A) or pressure (B)	15 gal	1½ kW	White or cream with coloured bands	£26 10 0 (A) £25 10 0 (B)	£12 8 1 (A) £11 18 9 (B)
	U.D.B.–20	Floor mounting, pressure	20 gal	1 kW plus 2 kW	Mottled grey	£29 0 0	£13 11 6
	U.D.B.–20	Floor mounting, pressure (A) or wall mounting, pressure (B)	20 gal	1 kW plus 2 kW	White with blue bands	£30 0 0 (A) £30 15 0 (B)	£14 0 10 (A) £14 7 10 (B)
	U.D.B.–30	Floor mounting, pressure	30 gal	1 kW plus 2 kW	Mottled grey	£34 10 0	£16 3 0
	U.D.B.–30	Floor mounting, pressure (A) or wall mounting, pressure (B)	30 gal	1 kW plus 2 kW	White with blue bands	£35 10 0 (A) £36 5 0 (B)	£16 12 4 (A) £16 19 4 (B)
	I.S.	Floor mounting, pressure	40 gal	3 kW and 6 kW	White with blue bands	£55 0 0 (3 kW) £63 16 0 (6 kW)	£25 14 10 (3 kW) £29 17 3 (6 kW)
	B.B.T.	Wall mounting, cistern	5 gal	1 kW	White or cream with coloured bands	£23 0 0	£10 15 4

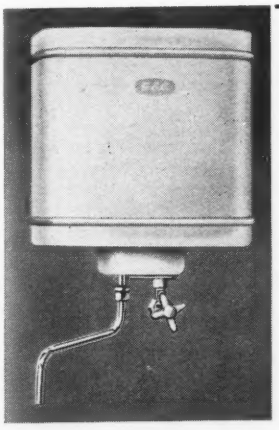
Manufacturer	Name or Model	Type	Capacity	Loading	Finish	Price (excl. tax)	Purchase Tax
AIDAS ELECTRIC, LTD., Sadia Works, Rowdell Road, Northolt, Greenford, Middlesex. *(continued)*	L.B.T.	Wall mounting, cistern	7½ gal	1 kW	White or cream with coloured bands	£27 10 0	£12 17 5
	C.B.T.	Wall mounting, cistern	12 gal	1 or 1½ kW	White or cream with coloured bands	£30 10 0	£14 5 6
	D.B.T.	Wall mounting, cistern	15 gal	1½ kW	White or cream with coloured bands	£33 10 0	£15 13 7
	U.D.B./B.T.	Wall mounting or floor mounting, cistern	20 gal	2 or 3 kW	White with blue bands	£37 0 0	£17 6 4
	U.D.B./B.T.	Wall mounting or floor mounting, cistern	30 gal	2 or 3 kW	White with blue bands	£42 10 0	£19 17 10
BERRY'S ELECTRIC, LTD., Touchbutton House, Newman Street, London, W.1.	"New Look"	Sink or basin	1½ gal	750 W	Green, blue, white or cream, chromium fittings	£12 17 6 (a.c.) £13 16 6 (d.c.)	£6 0 6 (a.c.) £6 9 5 (d.c.)
	A.Q./3	Sink or basin	3 gal	1 or 2 kW	Green, blue, white or cream, chromium fittings	£11 19 6 (1 kW) £12 9 6 (2 kW)	£5 12 1 (1 kW) £5 16 9 (2 kW)
	A.Q./1½	Sink or basin	1½ gal	750 W or 1 kW	Green, blue, white or cream, chromium fittings	£10 17 6 (750 W) £11 1 0 (1 kW)	£5 1 10 (750 W) £5 3 5 (1 kW)
BRITISH NATIONAL ELECTRICS, LTD., Newarthill, Motherwell, Lanarkshire.	B.N.E.	Non-pressure	1½ gal	750 W	White	£10 10 0	£4 18 4
	B.N.E.	Non-pressure	3 or 5 gal	1 kW	White	£12 10 0 (3 gal) £19 15 0 (5 gal)	£5 17 0 (3 gal) £9 4 10 (5 gal)
	B.N.E.	Non-pressure	12 gal	1½ kW	White	£29 15 0	£13 18 6
	B.N.E.	Pressure	5 gal	1 kW	White	£18 5 0	£8 10 10
	B.N.E.	Pressure	12 gal	1½ kW	White	£26 12 6	£12 9 3
	B.N.E. "Twin"	Dual-purpose	20 or 30 gal	500 W (upper) 2½ kW (lower)	White	£31 0 0 (20 gal) £36 10 0 (30 gal)	£14 10 2 (20 gal) £17 1 8 (30 gal)



1. *Berry's 3 gal water heater (A.Q./3)*
2. *British National Electrics "Twin" dual-purpose model*
3. *Aidas "Select" 3 gal model*
4. *Aidas "Two-Plus" water heater*
5. *Berry's "New Look" 1½ gal model*

Manufacturer	Name or Model	Type	Capacity	Loading	Finish	Price (excl. tax)	Purchase Tax
CREDA (SIMPLEX ELECTRIC, LTD.), Blythe Bridge, Stoke-on-Trent, Staffs.	C142	Non-pressure	3 gal	1 kW	White or cream	£12 5 0	£5 14 8
	"Crusader" C143	Non-pressure	3 gal	2 kW	White or cream	£12 5 0	£5 14 8
	BS7505	Non-pressure	5 gal	1 kW	White	£19 10 0	£9 2 6
	BS7505P	Pressure	5 gal	1 kW	White	£18 0 0	£8 8 6
	C7505BR	Cistern	5 gal	1 kW	White	£25 0 0	£11 14 0
	BS7512P	Pressure	12 gal	2 kW	White	£25 10 0	£11 18 8
	BS7512	Non-pressure	12 gal	2 kW	White	£27 5 0	£12 15 1
	C7512BR	Cistern	12 gal	2 kW	White	£36 10 0	£17 1 8
	"Dulec"	Dual-purpose	18·7 gal	3 kW	White	£29 0 0	£13 11 5
ELTRON (LONDON), LTD., Accrington Works, Strathmore Road, Croydon, Surrey.	S.N.3	Small. Non-pressure under basin	¾ gal	1 kW	White enamel	£11 3 0	£5 0 4
	E.B.5	Overflow wall mounting	1½ gal	2 kW	White enamel	£14 10 0	£6 10 6
	S.N.L.15	Under sink kitchen unit heater	3½ gal	2 kW	White enamel	£32 10 0	£14 12 6
GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.	"Superspeed" Double-two DE.702	Non-pressure (single-point)	2 gal	1·2 kW or 2 kW	White stoved enamel or honeysuckle. Choice of coloured bands	£12 7 6	£5 15 10
	DE.705	Non-pressure (single-point)	5 gal	1 kW	White stoved enamel	£19 15 0	£9 4 10
	DE.710	Non-pressure (single-point)	12 gal	1½ kW	White stoved enamel	£29 15 0	£13 18 6
	DE.715	Pressure (multi-point)	15 gal	1½ kW	White stoved enamel	£30 10 0	£14 5 6
	DE.730	Pressure (multi-point)	30 gal	3 kW	White stoved enamel	£51 10 0	£24 2 0
	DE.731	Pressure (multi-point)	30 gal	3 kW (d.c.)	White stoved enamel	£53 10 0	£25 0 9
	DE.790	Pressure (multi-point)	20 gal	3 kW	White stoved enamel	£34 0 0	£15 18 3
	DE.726	Cistern	15 gal	1½ kW	White stoved enamel	£39 7 6	£18 8 7
	DE.727	Cistern	20 gal	2 kW	White stoved enamel	£42 10 0	£19 17 10
HEATRAE, LTD., Heatrae Works, Norwich.	"Lido"	Non-pressure	1½ gal (a) 2·2 gal (b) 3 gal (c)	0·75 or 1 kW (a) 1 or 1·5 kW (b) 1 or 2 kW (c)	White or cream body with blue, green, red or black base	£10 12 6 (a) £11 0 0 (b) £12 9 0 (c)	£4 19 6 (a) £5 3 0 (b) £5 16 6 (c)
	D.O.T.	Non-pressure	1½ gal (a) 3 gal (b)	0·75 kW (a) 1 kW (b)	White	£13 3 6 (a) £16 8 0 (b)	£6 3 4 (a) £7 13 6 (b)
	R.T.A.	Non-pressure	5 gal (a) 12 gal (b) 15 gal (c) 20 gal (d) 30 gal (e)	1 or 3 kW (a) 1·5 or 3 kW (b) 1·5 or 3 kW (c) 2 or 3 kW (d) 3 kW (e)	White	£20 17 6 (a) £28 13 0 (b) £32 3 6 (c) £42 4 0 (d) £49 10 6 (e)	£9 15 5 (a) £13 8 3 (b) £15 1 3 (c) £19 15 0 (d) £23 3 7 (e)
	U.B.	Non-pressure	2 gal	2 kW	White	£18 18 6	£8 17 2
	S.E.B.	Non-pressure	12 gal	4 kW	White	£31 7 0	£14 13 6
	R.T.	Pressure	5 gal (a) 12 gal (b) 15 gal (c) 20 gal (d) 30 gal (e)	1 or 3 kW (a) 1·5 or 3 kW (b) 1·5 or 3 kW (c) 2 or 3 kW (d) 3 kW (e)	White	£19 3 0 (a) £26 18 0 (b) £30 8 0 (c) £40 9 0 (d) £47 15 6 (e)	£8 19 3 (a) £12 11 10 (b) £14 4 7 (c) £18 18 8 (d) £22 7 3 (e)
	Table pattern	Pressure	30 gal (a) 40 gal (b)	3 kW (a) 6 kW (b)	White	£96 8 6 (a) £106 1 0 (b)	£45 2 7 (a) £49 12 8 (b)
	"One-Twenty"	Pressure	20 gal	3 kW	Grey (a) or white (b)	£30 1 0 (a) £31 8 6 (b)	£14 1 3 (a) £14 14 3 (b)
	"One-Thirty"	Pressure	30 gal	3 kW	Grey (a) or white (b)	£38 17 6 (a) £40 13 0 (b)	£18 3 11 (a) £19 0 6 (b)

Manufacturer	Name or Model	Type	Capacity	Loading	Finish	Price (excl. tax)	Purchase Tax
HEATRAE, LTD., Heatrae Works, Norwich. *(continued)*	M.A.X.	Pressure	15 gal	2·25 kW	White	£31 2 0	£14 11 2
	G.C.F.	Non-pressure	30 gal *(a)* 40 gal *(b)*	3 kW *(a)* 6 kW *(b)*	White	£110 5 0 *(a)* £121 16 0 *(b)*	£51 11 11 *(a)* £57 0 0 *(b)*
	R.T.F.	Pressure	30 gal *(a)* 40 gal *(b)*	4·5 kW *(a)* 6 kW *(b)*	White	£61 11 6 *(a)* £92 10 0 *(b)*	£28 16 5 *(a)* £43 5 10 *(b)*
	F.B.	Non-pressure	5 gal *(a)* 12 gal *(b)* 15 gal *(c)* 20 gal *(d)* 30 gal *(e)*	1 or 3 kW *(a)* 1·5 or 3 kW *(b)* 1·5 or 3 kW *(c)* 2 or 3 kW *(d)* 3 kW *(e)*	White	£31 15 0 *(a)* £42 5 0 *(b)* £47 13 0 *(c)* £58 4 6 *(d)* £68 12 6 *(e)*	£14 17 2 *(a)* £19 15 6 *(b)* £22 6 0 *(c)* £27 5 0 *(d)* £32 2 4 *(e)*
	R.B.	Non-pressure	12 gal *(a)* 15 gal *(b)* 20 gal *(c)* 30 gal *(d)*	1·5 or 3 kW *(a)* 1·5 or 3 kW *(b)* 2 or 3 kW *(c)* 3 kW *(d)*	White	£42 5 0 *(a)* £47 13 0 *(b)* £58 4 6 *(c)* £68 12 6 *(d)*	£19 15 6 *(a)* £22 6 0 *(b)* £27 5 0 *(c)* £32 2 4 *(d)*
	R.B.F.	Non-pressure	30 gal *(a)* 40 gal *(b)*	4·5 kW *(a)* 6 kW *(b)*	White	£72 16 6 *(a)* £104 6 6 *(b)*	£34 1 8 *(a)* £48 16 6 *(b)*
THE HOTPOINT ELECTRIC APPLIANCE CO., LTD., Crown House, Aldwych, London, W.C.2.	NC1A *(a)* NC2A *(b)* NC3A *(c)*	Non-pressure, wall mounting, flat back	1½ gal *(a)* 2·2 gal *(b)* 3 gal *(c)*	1 kW *(a)* 1·5 kW *(b)* 2 kW *(c)*	White or cream, red trim, chromium outlet	£10 12 6 *(a)* £11 0 0 *(b)* £12 9 0 *(c)*	£4 19 6 *(a)* £5 3 0 *(b)* £5 16 6 *(c)*



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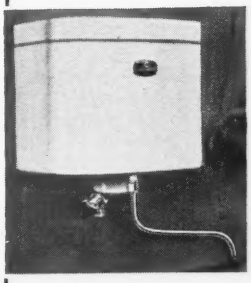
6. *G.E.C. "Double-Two" 2 kW model*
7. *Creda "Crusader" 3 gal heater*
8. *Heatrae type FB cistern water heater*
9. *Hotpoint model NC1A 1½ gal water heater*
10. *Heatrae "Lido" water heater*
11. *Creda "Dulec" dual-purpose heater*
12. *Eltron E.B.5 1½ gal model*



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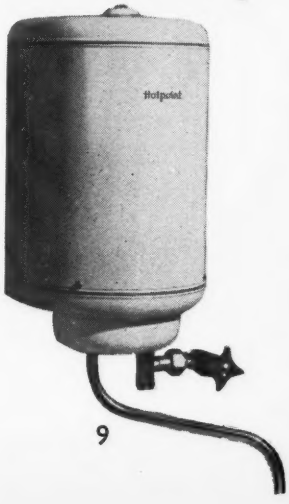

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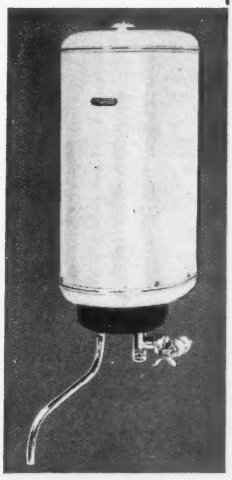

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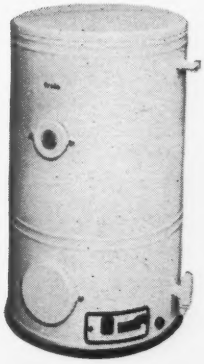

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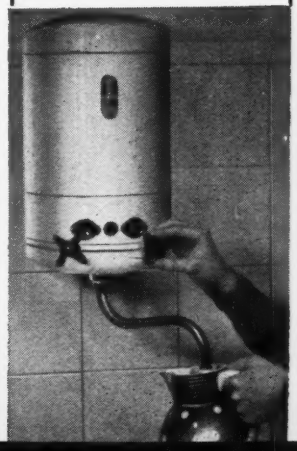

Manufacturer	Name or Model	Type	Capacity	Loading	Finish	Price (excl. tax)	Purchase Tax
THE HOTPOINT ELECTRIC APPLIANCE CO., LTD., Crown House, Aldwych, London, W.C.2. *(continued)*	NC 5A *(a)* NC12A *(b)* NC15A *(c)*	Non-pressure, wall mounting, cylindrical	5 gal *(a)* 12 gal *(b)* 15 gal *(c)*	1 kW *(a)* 1·5 kW *(b)* 1·5 kW *(c)*	White stoved enamel	£20 17 6 *(a)* £28 13 0 *(b)* £32 3 6 *(c)*	£9 15 5 *(a)* £13 8 3 *(b)* £15 1 3 *(c)*
	PC 5A *(a)* PC12A *(b)* PC15A *(c)* PC20A *(d)*	Pressure, wall mounting, cylindrical	5 gal *(a)* 12 gal *(b)* 15 gal *(c)* 20 gal *(d)*	1 kW *(a)* 1·5 kW *(b)* 1·5 kW *(c)* 2 kW *(d)*	White stoved enamel	£19 3 0 *(a)* £26 18 0 *(b)* £30 8 0 *(c)* £40 9 0 *(d)*	£8 19 3 *(a)* £12 11 10 *(b)* £14 4 7 *(c)* £18 18 8 *(d)*
	PB30A	Pressure, floor mounting, cylindrical	30 gal	4·5 kW	White stoved enamel	£61 11 6	£28 16 5
	SA 5A *(a)* SA12A *(b)* SA15A *(c)* SA20A *(d)* SA30A *(e)*	Cistern, wall mounting, rectangular	5 gal *(a)* 12 gal *(b)* 15 gal *(c)* 20 gal *(d)* 30 gal *(e)*	1 kW *(a)* 1·5 kW *(b)* 1·5 kW *(c)* 2 kW *(d)* 3 kW *(e)*	White stoved enamel	£31 15 0 *(a)* £42 5 0 *(b)* £47 13 0 *(c)* £58 4 6 *(d)* £68 12 6 *(e)*	£14 17 2 *(a)* £19 15 6 *(b)* £22 6 0 *(c)* £27 5 0 *(d)* £32 2 4 *(e)*
	ND2A	Non-pressure, under-sink, rectangular	2 gal	2 kW	White stoved enamel	£18 18 6	£8 17 2
	"Dulec" AC *(a)* "Dulec" DC *(b)* "Dulec" AC *(c)* "Dulec" DC *(d)*	Pressure, floor mounting, cylindrical, dual-purpose	20 gal *(a and b)* 30 gal *(c and d)*	3 kW	White stoved enamel	£31 0 0 *(a)* £34 3 0 *(b)* £36 10 0 *(c)* £39 13 0 *(d)*	£14 10 2 *(a)* £15 19 7 *(b)* £17 1 8 *(c)* £18 11 2 *(d)*
JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, London, S.W.1.	"Jill" 921	Non-pressure	1½ gal	0·75 or 1 kW	All white or cream or base plate cover in blue or eau-de-nil	£10 5 0	£4 16 0
	"Jill" 923	Non-pressure	3 gal	1 or 2 kW	All white or cream or base plate cover in blue or eau-de-nil	£11 0 0	£5 3 0
DUNCAN LOW, LTD., 57-61, Trossachs Street, Glasgow, N.W.	"Dulec"	Pressure, dual-purpose	20 or 30 gal	Top: 500 W Bottom: 2½ kW	White stoved enamel	£31 0 0 (20 gal) £36 10 0 (30 gal)	£14 10 2 (20 gal) £17 1 8 (30 gal)
MITCHELL ELECTRIC, LTD., 88-90, Tennant Street, Birmingham, 15.	"Streamline"	Non-pressure	1½ gal	750 W	White, cream, blue or green	£10 19 6	£5 2 8
	"Streamline"	Non-pressure	2 gal	1 kW	White, cream, blue or green	£11 5 6	£5 5 6
	"Streamline"	Non-pressure	3 gal	1 kW	White, cream, blue or green	£11 11 0	£5 8 2

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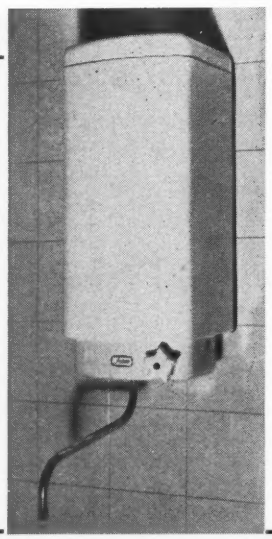

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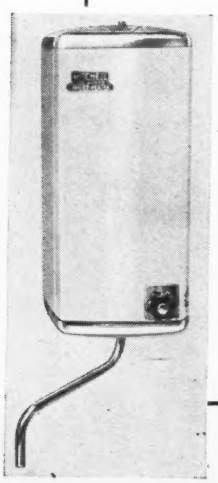

13. *Mitchell Electric "Streamline" model*
14. *Jackson "Jill" 3 gal water heater*
15. *Santon "Monmouth" dual-purpose heater*
16. *W. H. Smith "Eziot" type BWT cistern model*

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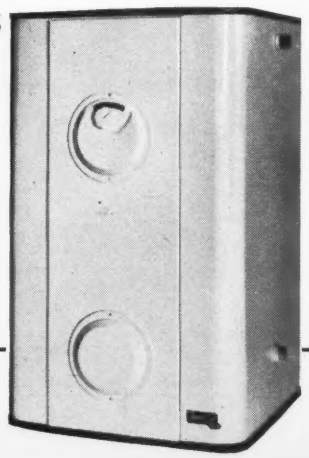

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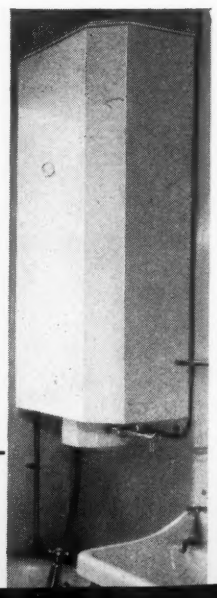

Manufacturer	Name or Model	Type	Capacity	Loading	Finish	Price (excl. tax)	Purchase Tax
SANTON, LTD., Somerton Works, Newport, Mon.	FB/2	Non-pressure	2 gal	1·2 or 2 kW	White or cream stoved enamel	£11 17 6	£5 11 2
	NPT	Non-pressure	1½ to 20 gal	750 W to 2 kW	White enamel	£11 0 0 to £43 5 0	£5 3 0 to £20 4 10
	PT	Pressure, wall mounting	5 to 20 gal	1 to 2 kW	White enamel	£18 5 0 to £39 12 6	£8 10 10 to £18 10 11
	PT/FM	Pressure, floor mounting	20 gal (*a*) and 30 gal (*b*)	2 kW (*a*) and 3 kW (*b*)	White enamel	£56 5 0 (*a*) £68 0 0 (*b*)	£26 6 6 (*a*) £31 16 6 (*b*)
	DF	Cistern, wall mounting	5 to 20 gal	1 to 2 kW	White enamel	£26 5 0 to £48 0 0	£12 5 8 to £22 9 3
	DF/FM	Cistern, floor mounting	20 gal (*a*) and 30 gal (*b*)	2 kW (*a*) and 3 kW (*b*)	White enamel	£67 10 0 (*a*) £80 0 0 (*b*)	£31 11 10 (*a*) £37 8 10 (*b*)
	DF/R	Rectangular, cistern, wall mounting	5 gal (*a*) and 12 gal (*b*)	1 kW	White enamel	£35 10 0 (*a*) On application (*b*)	£16 12 3 (*a*) (*b*)
	NPT/E	Non-pressure, wall mounting	12 gal (*a*) and 15 gal (*b*)	1½ kW	White enamel	£29 15 0 (*a*) £33 17 6 (*b*)	£13 18 6 (*a*) £15 17 1 (*b*)
	PT/E	Pressure, wall mounting	12 to 20 gal	1½ and 2 kW	White enamel	£26 12 6 to £32 0 0	£12 9 3 to £14 19 6
	PT/EFM	Pressure, floor mounting	20 gal (*a*) and 30 gal (*b*)	3 kW	White enamel	£42 0 0 (*a*) £51 10 0 (*b*)	£19 13 2 (*a*) £24 2 1 (*b*)
	DF/E	Cistern, wall mounting	12 to 20 gal	1½ and 2 kW	White enamel	£35 15 0 to £42 10 0	£16 14 8 to £19 17 10
	DF/EFM	Cistern, floor mounting	20 gal (*a*) and 30 gal (*b*)	3 kW	White enamel	£52 0 0 (*a*) £60 0 0 (*b*)	£24 6 9 (*a*) £28 1 7 (*b*)
	"Monmouth"	Automatic dual, pressure	12 gal (*a*) and 20 gal (*b*)	Top: 3 kW Bottom: 3 kW	Cream enamel	£32 0 0 (*a*) £35 0 0 (*b*)	£14 19 6 (*a*) £16 7 7 (*b*)
	PT/FM	Pressure, floor mounting	2½ gal	1 kW	White enamel	£17 5 0	£8 1 6
	NPT/FM	Non-pressure, floor mounting	2½ gal	1 kW	White enamel	£20 15 0	£9 14 3
W. H. SMITH (EZIOT), LTD., 32, Mansfield Street, Church Gate, Leicester.	"Eziot" WT	Non-pressure	1½ gal	750 W	White or cream, etc.	£10 10 0	£4 18 4
	"Eziot" WT	Non-pressure	3 gal	1 kW	White or cream, etc.	£12 5 0	£5 14 8
	"Eziot" BWT	Built-in cistern	12 gal	1½ kW	White or cream, etc.	£36 6 6	£17 0 0

CATALOGUES AND LISTS

CABLES. — 14-page booklet entitled "Behind the Signs," giving particulars of the Henley range of cables for luminous discharge tube installations.—**W. T. Henley's Telegraph Works Co., Ltd.,** 51-53, Hatton Garden, London, E.C.1.

CABLE MARKERS.—Two brochures describing the "Plansel" cable markers and sleeves in p.v.c., Neoprene and rubber and the new strip markers introduced by the company.—**Creators, Ltd.,** Woking, Surrey.

DISTRIBUTION EQUIPMENT. — 55-page illustrated catalogue (C/W3) dealing with the company's range of joint boxes, terminal boxes, service fuses and accessories, etc., for indoor and outdoor installation up to 660 V.—**W. T. Henley's Telegraph Works Co., Ltd.,** 51-53, Hatton Garden, London, E.C.1.

ELECTRONIC EQUIPMENT.—Illustrated brochure describing the "Rapikon" electronic chassis assembly system.—**Shandon Electronics, Ltd.,** 6, Cromwell Place, London, S.W.7.

LAMPS.—Illustrated catalogue giving details and prices of over 1,500 types of "Mazda" lamps, together with a ready reckoner, circuit diagrams and details of auxiliary gear, etc.—**A.E.I. Lamp & Lighting Co., Ltd.,** Crown House, Aldwych, London, W.C.2.

SPACE HEATING.—24-page illustrated catalogue, together with price list giving particulars of the range of "Thermovent" space heating equipment.—**E. K. Cole, Ltd.,** 5, Vigo Street, London, W.1.

TERMINATIONS. — Folder containing leaflets on the Series "100" sub-miniature high voltage terminations for use with electronic equipment.—**Precision Electronic Terminations, Ltd.,** St. John's Hill, Sevenoaks, Kent.

TIME RECORDERS.—Illustrated folder dealing with a master control system for visual, audible and recorded time.—**Blick Time Recorders, Ltd.,** 96-100, Aldersgate Street, London, E.C.1.

TRANSFORMERS.—Folder giving details of the types of transformers, chokes and inductors produced by the company.—**Atkins, Robertson & Whiteford, Ltd.,** Industrial Estate, Thornliebank, Glasgow.

VARIABLE SPEED GEARS.—24-page illustrated catalogue (A/3) giving particulars of the company's type "A" hydraulic infinitely variable speed gears and auxiliary equipment.—**Carter Gears, Ltd.,** Thornbury Road, Bradford, 3.

VIBRATORY FEEDERS.—Three leaflets describing various types of feeder units available from the company.—**Magnetic Equipment Co., Ltd.,** Lake Works, Portchester, Hants.

WELDING EQUIPMENT. — Catalogue (WA/137) describing multi-operator a.c. arc-welding equipment and two leaflets dealing respectively with a new portable rectifier welding equipment and a range of welding transformers.—**English Electric Co., Ltd.,** Welding Equipment Department, East Lancashire Road, Liverpool, 10.

WIRING ACCESSORIES. — Illustrated brochure describing the "Striplock" technique for mounting switches and sockets in partitioning.—**Falk, Stadelmann & Co., Ltd.,** 91, Farringdon Road, London, E.C.1.

Illustrated 88-page catalogue giving prices and particulars of the company's range of wiring accessories.—**M. K. Electric, Ltd.,** Wakefield Street, Edmonton, London, N.18.

Financial Section

STOCKS and SHARES

AT the beginning of this week the indices to industrial share prices had dropped below the points of depression touched at the time of the Suez crisis a year ago, and stood consequently at the lowest level recorded for more than three years. For the latest drop the blame was apportioned about equally between anxiety over wage claims, continued uncertainty about American business prospects, and some more disconcerting company news. In the last connection the reports of more difficult trading conditions from such firms as Courtaulds, Associated Portland Cement and A. E. Reed made a wide impression. By contrast, the electrical market has again seen some good company results, including those announced by Crompton Parkinson, Crabtree Electrical Industries and Falk Stadelmann.

Crompton Parkinson

Crompton Parkinson's statement of the 1956–7 results left a very satisfactory impression in the market. The improvement in the net profit to just over a million (after tax) is of the order of 9 per cent, and gives almost threefold cover for the amount distributed in ordinary dividend. The latter is being brought up to a total of 16 per cent, the same as before except that it is declared all as dividend, whereas 6 per cent of last year's distribution was described as bonus. In raising the interim payment earlier this year the directors had advised shareholders not to take this as an earnest of a larger total. They make the same proviso in announcing now the intention of distributing a one-for-two scrip issue through the capitalisation of nearly £2 million of the reserves. A yield of 5¾ per cent on the 5s shares at 14s is in line with the average return from other leading investments in the electrical industry.

Falk Stadelmann

Good figures appeared in the Falk Stadelmann company's statement of the results for the year ended last March, the trading profit of £701,000 being £93,000 more than the previous year's, and the net surplus (after tax of £223,000) about 20 per cent to the good. The increase is being used to enlarge the proportion of profits ploughed back into the business, leaving the dividend unchanged at the rate of 17½ per cent paid on the two preceding occasions. Last year's annual report described continued progress in the field of domestic electrical appliances and plans for actively developing the sections of the business concerned with such production. At 35s the £1 shares are on a yield basis of 10 per cent.

Morphy-Richards

The 4s shares of Morphy-Richards, quoted in the market at a little under 15s, stand well below their recent best but still a half-crown above their value at the beginning of this year. They show a yield of about 5½ per cent on the 20 per cent dividend paid in respect of the year ended last June, for which the full accounts have lately been pub-

Price Changes in

Company or Board	Nom. Value	Middle price 4th Nov	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	71	−½	3	3	4 4 6	80	70
Brit. Elec. 1974/77	100	67½		3	3	4 9 0	78½	66
Brit. Elec. 1976/79	100	70½		3½	3½	4 19 3	81½	70
Brit. Elec. 1974/79	100	81		4½	4½	5 5 0	92½	79½
Overseas Electric Supply								
Calcutta Elec.	£1	16/6	−6d	6†	6·8†	8 4 9†	19/-	15/-
East African Power	£1	19/6	−6d	7	7½	7 13 9	21/-	19/-
Nigerian Elec.	£1	16/6	−1/-	10	10	12 2 6	18/6	16/6
Perak Hydro-Elec.	£1	16/-		10	12½	15 12 6	18/-	13/3
Electrical Shares								
Aberdare Cables	5/-	10/3		17½	17½	8 10 9	12/6	9/9
Aerialite	1/-	5/6	+3d	45	48	8 14 6	6/9	4/9
Allen, W. H.	£1	38/3		10	10	5 4 6	47/3	33/6
Anglo-Portuguese Tel.	£1	21/3		8	8	7 10 6	27/6	20/6
Aron Elec. Ord.	£1	55/-		15	15	5 9 0	60/-	53/6
Assoc. Elec. Ord.	£1	50/-	−2/6	15	15	6 0 0	73/-	50/-
Automatic Tel. & El.	£1	60/-	−1/3	15	17	5 13 3	75/-	54/6
Babcock & Wilcox	£1	56/3	−2/6	15	15	5 6 9	82/6	56/3
Bakelite	10/-	21/3	−6d	16	15	7 1 3	24/6	20/9
Baldwin, H. J.	2/-	4/3		20	20	9 8 3	5/-	3/10½
Berry's Electric	5/-	5/9	−3d	—	10	8 14 0	6/6	5/6
British Aluminium	£1	38/9	−3/3	12	12	6 3 9	71/3	38/9
Brit. Elec. Traction: Def. Ord. "A"	5/-	18/-xd	−1/3	22½	25	6 19 0	25/-	17/-
B.I. Callender's	£1	41/6	−1/-	12½	12½	6 0 6	55/-	41/-
B.I. Callender's 6% Pref.	£1	20/-		6	6	6 0 0	21/9	19/-
British Tabulating	£1	38/-		9	9	4 14 9	56/3	38/3
British Thermostat	5/-	22/6		25	25	5 11 0	27/6	22/6
British Vac. Cleaner	5/-	5/-		15	10	10 0 0	8/-	5/-
Brook Motors	10/-	33/9		25	25	7 8 3	37/6	30/-
Bulgin, A. F.	1/-	4/6	+3d	50	40*	8 17 9	5/6	4/-
Burco Dean	5/-	11/3	−3d	22½	20	8 17 9	14/-	8/9
Cable & Wireless: Ord.	5/-	9/6		10	10	5 5 3	12/6	9/6
4% Loan	100	91½		4	4	4 7 6	92½	89
Chloride El. Storage "A"	£1	55/9	−2/6	17½	17½	6 5 6	68/9	55/9
Clarke Chapman	£1	121/3		22½	27½	4 10 9	9	6
Cole, E. K.	5/-	16/6	−6d	17½	17½	5 6 0	23/6	16/6
Cossor, A. C.	5/-	5/3		Nil	2½	2 7 6	7/3	5/3
Crabtree	10/-	23/9		20	20	8 8 6	26/-	23/3
Crompton Parkinson Ord.	5/-	14/-	−1/-	16	16	5 14 3	17/9	14/-
De La Rue	5/-	21/3	+3d	30	35	8 4 9	24/9	16/3
Decca "A"	4/-	22/-	−1/3	43¾	43¾	7 19 0	32/3	22/-
Desoutter	5/-	33/6	−1/-	30	32½	4 17 0	35/6	27/6
Dewhurst	2/-	6/6		30	16½*	5 0 0	7/9	5/9
Dictograph Tel.	2/-	5/6		20	20	—	6/3	5/3
Dubilier Condenser	1/-	3/-	−3d	30	30	—	8/1½	3/3
Duport	5/-	17/-		23	25	7 7 0	21/-	17/-
E.M.I.	10/-	26/-xd	−1/-	15	15	5 15 6	36/-	23/9
Electrical Components	5/-	7/3		25	12½*	8 12 6	8/-	6/6
Elec. Construction	£1	23/9		8½	8½	7 3 3	27/6	21/9
Elliott-Automation	5/-	12/6		—	10‡	4 0 0	12/6	10/3
Enfield Cable Ord.	£1	13/6	−1/6	Nil	Nil	Nil	21/6	13/-
English Electric	£1	50/-	−2/6	12½	14	5 12 0	65/-	47/6
English Electric 3¾% Pref.	£1	12/3	+3d	3¾	3¾	6 2 6	14/3	11/3
Ericsson Tel.	5/-	38/-	−1/6	20†	22†	2 18 0†	50/-	33/3
Ever Ready	5/-	15/3xd	−1/-	35	37½	6 3 0*	20/-	14/3
Falk Stadelmann	£1	35/-		17½	17½	10 0 0	40/6	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

lished. In that period, the parent company's sales reached £5 million for the first time. Because of rising costs, trading profits rose to a much smaller extent than did turnover, and after increased charges the net surplus came out rather lower than before at £216,000, subject to special non-recurring items amounting to £50,000. In his review accompanying the report, the chairman makes the point that although the output capacity of Morphy-Richards and the Astral subsidiary was doubled by the opening of new factories during the year, the accounts for 1956–57 reflected none of the benefits and some substantial extra costs on the debit side. The company's 21st annual meeting is to be held on 20th November.

Electrical Investments

Company or Board	Nom. Value	Middle price 4th Nov.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1957 Highest	1957 Lowest
Electrical Shares—continued								
G.E.C. Ord.	£1	38/9	−2/6	14	12½	6 9 0	58/9	38/9
G.E.C. 6½ Pref.	£1	20/-		6½	6½	6 10 0	23/6	19/6
General Cables	5/-	12/6	−6d	30	30	12 0 0	15/6	11/6
Greenwood & Batley	£1	50/-		17½	17½	7 0 0	51/3	45/3
Hackbridge Holdings	5/-	12/3		30	20	8 3 3	21/9	12/-
Hackbridge & Hewittic	5/-	10/-		23	20	10 0 0	16/-	10/-
Head Wrightson	5/-	16/6		20	22½	—	24/3	16/6
Heatrae	2/-	4/9		15	15	6 6 6	4/9	4/-
Henley's	10/-	11/9	−6d	11½	11½	9 15 9	17/-	11/6
Holophane	5/-	22/-xd	+2/9	30	37½	8 10 6	26/3	17/-
Hoover	5/-	30/-	−6d	50	50	8 6 9	44/-	24/9
I.C.I.	£1	36/6	−1/3	10	10	5 9 6	46/6	36/6
Intl. Combustion	5/-	20/-	−1/-	20	22½	5 10 0	30/-	20/-
Johnson & Phillips	£1	18/9	−1/3	15	10	10 13 3	34/6	18/9
Lancashire Dynamo	£1	35/-		11	11	6 5 9	45/9	35/-
Laurence, Scott	5/-	14/3		15	15	5 5 3	19/9	13/9
Lister, R A.	£1	23/3	−2/-	10	10	8 12 0	33/9	23/3
London Elec. Wire	£1	40/9	−1/3	12½	12½	6 2 9	53/9	40/9
Lucas, J.	£1	28/3	−6d	7½	7½	5 6 3	36/6	27/6
Marconi Marine	£1	33/-xd		10	10	6 1 3	37/-	31/-
Marryat & Scott	2/-	10/6		30	35	6 13 3	13/-	8/-
Mather & Platt	£1	48/9	−1/3	15	15	6 3 0	63/9	48/9
Metal Industries	£1	23/3	−2/-	Nil	9	7 14 9	30/-	20/3
Midland Elec. Mfg.	£1	47/6		12½	12½	5 5 3	52/6	45/-
Morphy-Richards	4/-	15/-xd		50	20*	5 6 9	20/-	11/6
Murex	£1	57/-	−1/3	20	20	7 0 3	79/6	58/3
Newman Ind.	2/-	2/9		10	10	7 5 6	2/9	2/1
Oldham & Son	1/-	2/6		17½	17½	7 0 0	3/-	2/3
Parnall (Yate)	5/-	6/-		12	12	10 0 0	8/9	5/9
Parsons, C. A.	£1	46/3	−1/3	8½	7½*‡	—	71/3	45/-
Plessey	10/-	65/-		27½	30	4 12 3	86/3	61/-
Pye "A" Deferred	5/-	12/6		12½	12½	5 0 0	20/-	12/-
Reyrolle	£1	73/9	−1/3	16½	17½	4 15 0	110/-	72/6
Rheostatic	4/-	7/-		18½	12½*	7 2 9	10/-	7/-
Richardsons Westgarth	5/-	13/9	−6d	16⅜	16⅜	6 1 3	20/-	13/9
Scottish Cables	4/-	14/3	−6d	27½	27½	7 14 6	19/3	14/3
Simon-Carves	5/-	23/9	−1/3	28½	20*	4 4 3	36/3	23/9
Smith (England), S.	4/-	13/-		17½	17½	5 7 9	16/-	13/-
Southern Areas	£1	11/3		7½	7½	13 6 9	20/-	11/3
Strand Elec.	5/-	5/9xd		15	15	13 0 6	8/-	5/9
Sturtevant	5/-	19/6		15†	15†	3 17 0†	27/-	19/6
Sun Elec.	£1	43/9	+1/9	20	25	11 8 6	43/9	42/-
Switchgear & Cowans	5/-	10/3		25	25	12 4 0	15/6	10/3
Taylor Tunnicliff	5/-	11/9		15	15	6 7 9	13/9	11/9
T.C.C.	10/-	37/6		25	25	6 13 3	41/3	35/-
T.C. & M.	£1	24/-	−6d	8½	8½	7 1 9	31/-	24/-
Telephone Mfg.	5/-	5/6	+3d	10	10	9 1 9	8/-	5/3
Telephone Rentals	5/-	10/-	−3d	12½	12½	6 5 0	12/6	10/-
Thompson (John)	5/-	24/-		25	25	5 4 3	37/-	24/-
Thorn Elec.	5/-	20/-	−1/3	15	17½	4 7 6	26/3	16/3
Thornycroft	£1	22/6	−3/9	12½	12½	11 2 3	37/6	22/6
Tube Investments	£1	52/-	−3/6	22½	15*‡	5 15 6	70/-	52/-
Vactric	5/-	15/9	−6d	17½	25	7 18 9	23/9	12/9
Veritys	5/-	7/9		12½	12½	8 1 3	9/3	7/9
Walsall Conduits	4/-	11/-		20	20	7 5 6	15/-	11/-
Ward & Goldstone	5/-	23/-		35	40	4 7 0	29/-	18/6
Watford	2/-	6/3		25	25	8 0 0	6/9	6/3
Wdstinghouse	£1	30/-	−1/3	18	9‡	6 0 0	41/3	29/6
West, Allen	5/-	9/6	−6d	15	15	—	13/6	9/6
Wolf Electric	5/-	9/-		20	20	5 11 0*	13/9	8/9

November Dividends

Among the dividend announcements expected within the next week or two is the declaration of a final payment by Brook Motors, whose accounts are made up to the end of September. On the last two occasions there has been a 20 per cent final, making an annual total of 25 per cent. A year ago, the accounts showed that while turnover had run at record levels, profits had been affected by the fall in commodity prices and by a temporary interruption in supplies. Good progress was indicated in the interim report issued last May. For the first half of the year, the profit was given as £410,000, in comparison with a figure of £240,000 representing half the profit of the year 1955–56, and the order book was said to remain satisfactory. Other companies due shortly to make their final dividend declarations include Plessey, Duport, Tube Investments, Lucas and S. Smith.

Crabtree Results

A yield approaching 8½ per cent is available from Crabtree Electrical Industries 10s shares, quoted at 23s 9d, on the basis of the 20 per cent dividend which has been paid for the last four years. In the preliminary statement of results covering the twelve months to last July, the margin between net earnings and the amount of the dividend is shown to have been substantially widened. With group trading profits some 18 per cent above the previous figures, the net surplus has expanded, despite a heavier tax charge of £211,000, to above £150,000. Allowing for the dividend on the preference shares, this appears to cover comfortably twice over the ordinary dividend distribution.

Oriental Telephone

Oriental Telephone 1s shares were well maintained at around 7os after the announcement of a new development in the process of distributing the value of the assets to the stockholders. In brief, there is an offer of a first and early instalment of 61s per share, to be taken either in cash, or partly in cash and partly in shares of the Hong Kong Telephone Company: for the purpose, the latter are valued at 27s each, although they have recently been quoted locally at about 32s 10d. A further cash payment from additional receipts would be made later. Among the reasons given for the directors' recommendation of acceptance is the estimate that the proposal should produce 3s per share more than would be received in a liquidation, and a quicker distribution of the first large instalment. The offer remains open until 29th November, with a possible extension.

REPORTS and DIVIDENDS

Crompton Parkinson, Ltd., report a consolidated income for the year ended 30th June last after all charges, except taxation and transfer to specific reserves, of £2,494,499, as compared with £2,325,431 for the preceding year. Taxation requires £1,396,844 and specific reserves receive £38,408, leaving a consolidated net income of £1,059,247 (against £996,002), of which £1,018,991 is taken to account by Crompton Parkinson. It is proposed to pay a final dividend of 10 per cent on the ordinary stock, making 16 per cent for the year (unchanged). For many years past a part of the total distribution has been in the form of a special cash bonus, but this arrangement is no longer considered necessary. A sum of £15,000 is again paid to the trustees of the Central Benevolent Fund, and after adding £21,837, taxation and other provisions no longer required, the surplus transferred to revenue reserve is £644,621 (£668,930).

It is proposed to increase the authorised share capital from £5,950,000 to £8,700,000 by the creation of a further 11 million ordinary shares of 5s each, and with a view to bringing the issued capital into better relationship with the capital employed in the business, that the capital reserve of £238,140 and £1,697,202 from unallocated revenue reserves should be capitalised by paying up in full 7,741,368 ordinary shares of 5s each for distribution to holders of ordinary stock at the rate of one new share for every two ordinary stock units held. The consent of the Treasury has been obtained. This recommendation does not imply any change in profits distribution policy and the total amount distributed in ordinary dividends will not necessarily be increased.

Peto Scott Electrical Instruments, Ltd.—The main figures in the accounts for the year ended 30th June last were given in our issue of 18th October. In his circulated statement, Major-General E. L. Bols (chairman) says that the lower prices for their sets have led to a decrease in the turnover, but the reduction in gross profit, which would otherwise have resulted, has been considerably offset by increased efficiency in production. The electronic contract work continues to prosper and they have now received a number of contracts from the various broadcasting companies for television cameras and allied equipment entirely developed by their company.

With the report and accounts the company has circulated proposals for the acquisition of the issued share capital of Conrad Electrical Co., Ltd. It has been made a condition of sale by the shareholders of Conrad that the shares of Peto Scott which will be issued to them as such consideration shall then be exchanged for shares in the Pena Copper Mines, Ltd., which has a substantial minority shareholding in Peto Scott. This will result in Pena acquiring the controlling interest in Peto Scott.

Morphy-Richards, Ltd.—The main figures in the accounts for the year to 30th June last were given in our issue of 18th October.

In his circulated statement, Mr. F. P. Bishop (chairman) says that a coming-of-age party last June was combined with the formal opening of the new factory at St. Mary Cray, which has doubled the productive capacity of the parent company. Almost simultaneously, the largest subsidiary, Astral Equipment, Ltd., took possession of a new factory which has also doubled the productive capacity at Dundee. Sales during the year once again exceeded all previous records. The parent company's sales topped £5 million while Astral sales at just over £900,000 showed an increase of 12 per cent. Against these figures they have to set some reduction in turnover of overseas subsidiaries. This is due mainly to the difficult trading conditions in Canada and Australia. Nevertheless the total export sales once again exceeded £1,000,000. The increase in the cash value of sales was due entirely to the expansion in turnover and not at all to any increase in the selling price of their products. Except in the case of the electric toaster, which is a new and improved model introduced this year, there has been no increase in the price of any of their products. A substantial contribution to the year's result was made by Yelsen, Ltd., the subsidiary company making electric blankets. The entire shareholding in this company was acquired with effect from 2nd March last.

Referring to the outlook, Mr. Bishop says that in the current year they will begin to derive substantial benefit from their new productive capacity. Among new products already in production at St. Mary Cray was a suction cleaner and a wall convector, the public reaction to which was encouraging. At Dundee a new and larger model refrigerator has been in production since May. The turnover in the first quarter of the current financial year has shown a satisfactory increase over the corresponding quarter of last year.

Dealing with export developments, the chairman says that within the last few months they have formed a new subsidiary company, Morphy-Richards Incorporated, in the United States. They have also formed a new company, in association with a well-known German manufacturer, to act as the distributing medium for their appliances in Germany. New arrangements have been concluded in South Africa for local manufacture of their heat-controlled irons, which will be distributed by the South African subsidiary, Morphy-Richards (Proprietary), Ltd.

The Oriental Telephone & Electric Co., Ltd., has entered into a formal agreement with Henry Ansbacher & Co., who have offered to purchase the 570,199 ordinary 1s stock units of the company. The consideration for the purchase includes an immediate cash payment of 61s per unit with the option to receive part of this in the form of shares in the Hongkong Telephone Co., Ltd., taken at 27s per share, in the ratio of three for every five Oriental units held. The balance of the offer price will consist of a second cash payment which will be equivalent to the further sum available to the company when the claims for compensation for assets acquired by the Governments of the Federation of Malaya and of Singapore have been finally settled. The directors of the Oriental Co. recommend the acceptance of the offer as the total per unit ultimately to be received should exceed by about 3s the estimated amount receivable in a liquidation, while on liquidation there would have been no option of receiving Hongkong Telephone shares.

The British Electric Transformer Co., Ltd., reports a net profit for the year to 30th June last, after charging depreciation, taxation, etc., of £72,188, as compared with £66,051 for the preceding year. It is proposed to pay a dividend for the year of 3s 6d per share on the 5s shares (against 3s).

Falk, Stadelmann & Co., Ltd.—The consolidated trading profit for the year to 31st March last is £700,622, as compared with £608,387 for 1955-56, and after providing £259,047 for taxation, the net profit is £223,571 (against £185,391). The dividend for the year is maintained at 17½ per cent by a final payment of 10 per cent.

Crabtree Electrical Industries, Ltd.—The preliminary statement for the year ended 31st July last shows a group trading profit of £433,457, as compared with £366,155 for the preceding year. After charging depreciation, etc., and £211,248 for taxation, the net balance is £150,950 (against £119,392). The dividend for the year is maintained at 20 per cent by a final payment of 12½ per cent.

The British Electric Resistance Co., Ltd., is paying a final dividend of 15 per cent, making 20 per cent (same) for the year ended 31st July last. After providing £32,780 for taxation, the net profit for the year was £25,323 (against £22,255). General reserve receives £7,000 and the balance carried forward is £10,395 (against £9,560 brought in).

Henley's Tyre & Rubber Co., Ltd.—We are informed that the capital of this company, at present owned by W. T. Henley's Telegraph Works Co., Ltd., will be acquired by the Avon India

Rubber Co. on 31st December. Manufacture of Henley tyres will be transferred from Gravesend to the premises of the Avon Co. at Melksham.

Senior Economisers, Ltd., has declared an interim dividend of 25 per cent (against 20 per cent). The directors state that the increased rate of the interim dividend does not indicate an increase in the total distribution for the year.

The Atlas Electric & General Trust, Ltd., has announced an interim dividend of 3 per cent (unchanged).

Rediffusion, Ltd., is paying an interim dividend of 5 per cent, tax free (unchanged).

New Companies

G. C. Rodwell, Ltd.—Registered 25th October. Capital £1,000. Manufacturers, designers, importers and exporters of, agents for and dealers in telecommunication, electronic, radar, electrical and mechanical equipment, etc. Directors: G. C. H. Rodwell, G. C. Rodwell and P. C. Rodwell. Regd. office: 232, Lavender Hill, Enfield, Middx.

Ernest Minchin & Son (Electrical), Ltd.—Registered 18th October. Capital £1,000. To acquire the business of an electrical engineer and contractor carried on by E. Minchin at Smethwick, etc. Directors: E. Minchin, Mrs. Elsie Minchin (secretary) and M. J. Minchin. Regd. office: 199, Cape Hill, Smethwick.

J. E. Fowler Auto Electric, Ltd.—Registered 2nd October. Capital £9,000. Manufacturers of and dealers in electrical, radio, sound recording, radio and television relay services, etc. Directors: J. E. Fowler and A. J. Sykes. Regd. office: 4, Bread Street, Wakefield.

Electric Actuator Co., Ltd.—Registered 3rd October. Capital £1,000. Manufacturers of and dealers in machinery, electrical motors for special purposes, particularly those used for the purpose of actuation machinery, etc. Directors: D. Sharp and J. Woodhead. Regd. office: 106, High Street, Colehill, Warwicks.

Roys (T.V.), Ltd.—Registered 3rd October. Capital £3,000. Manufacturers of and dealers in radio and television sets, etc. Directors: R. Pitt (managing) and Mrs. Shirley S. M. Pitt. Regd. office: 670, Muller Road, Eastville, Bristol.

Wefcoma, Ltd.—Registered 3rd October. Capital £5,000. Manufacturers of and dealers in gas and electric dish washing machines, gas and electric cookers, refrigeration and kitchen equipment, etc. Directors: W. E. Frech-Weinmann, W. B. Preibisch, L. Insley and H. B. Branden. Solicitors: Aukin & Co., 5, Queen Anne Street, W.1.

G. & S. (Neon), Ltd.—Registered 4th October. Capital £100. Manufacturers and installers of neon and fluorescent lighting equipment, etc. Directors: H. G. Dooley and D. Steele. Regd. office: 68, Argyle Street, Birkenhead.

Ward & Goldstone (Auto & Aircraft Equipment), Ltd.—Registered 29th October. Capital £100. Electricians and electrical engineers, installers and repairers of electric wiring systems in motor cars, aircraft, etc. Directors: S. Goldstone, D. S. Tesciuba and P. Jensen. Regd. office: 37, Brown Street, Manchester, 2.

Alex. A. Mayes, Ltd.—Registered in Edinburgh on 2nd July. Capital £15,000. Electrical and general engineers, etc. Directors: A. A. Mayes, Mrs. M. Mayes and R. A. Mayes. Regd. office: 4, Cockburn Street, Falkirk.

John Hill Electric (Exeter), Ltd.—Registered 28th October. Capital £10,000. Radio, television and electrical engineers, etc. Directors: J. G. J. Hill and H. J. Clutterbuck. Regd. office: 15, New North Road, Clock Tower, Exeter.

Increases of Capital

Electrical Services (Western), Ltd.—Increased by £448,000 in £1 ordinary shares, beyond the registered capital of £52,000.

G.W.B. Furnaces, Ltd.—Increased by £200,000, in £1 ordinary shares, beyond the registered capital of £50,000.

Bylock Electric, Ltd. — Increased by £45,000, in 1s "A" non-voting ordinary shares, beyond the registered capital of £100,000.

Gent & Co., Ltd.—Increased by £100,000, in £1 ordinary shares, beyond the registered capital of £200,000.

Bankruptcies

E. Woolley, lately carrying on business in partnership with another at 4, Station Road, Carlton, Notts, under the style of Cavendish Television & Radio Service, radio, television and electrical dealers and contractors.—Public examination 5th December at the Court House, St. Peter's Gate, Nottingham.

R. H. Henley (trading as Green and Henley), 92, Hersham Road, Hersham, Walton-on-Thames, Surrey, lately carrying on business at 79, High Street, Walton-on-Thames, export merchant (electrical goods).—First and final dividend of 3s 10¾d in the £, payable on and after 15th November at 58-61, York Terrace, Regent's Park, N.W.1.

J. F. Creasey, 5, Eccleston Crescent, Chadwell Heath, Romford, Essex, electrical installation engineer, formerly carrying on business under the name of Creasey Electrical Co., at 2, Regent Square, London, W.C.1, and 3, Fanshawe Avenue, Barking. Trustee, Mr. W. J. W. Hill, 58-61, York Terrace, Regent's Park, London, N.W.1, Official Receiver, released 21st October.

J. J. Glover, 24, Market Place, Reading, electrical contractor.—Order made 26th September suspending bankrupt's discharge for three months until 26th December.

H. Parkinson, trading as Electrolite Engineers, 9, Market Street, Hindley, near Wigan, as an electrical engineer.—Trustee, Mr. A. K. Ferguson, West Africa House, 25, Water Street, Liverpool, 2, Official Receiver, released 23rd October.

C. R. Clarke, lately trading at Kingham Way, Luton, under the style of C. R. Clarke, electrical contractor.—Last day for receiving proofs for dividend 8th November. Trustee, Mr. C. A. Taylor, 6, The Parade, Northampton, Official Receiver.

E. Newland, electrical contractor, 130, Grove Road, Chadwell Heath, Romford, Essex.—Last day for receiving proofs for dividend 13th November. Trustee, Mr. D. A. Jacobs, 18, Bentinck Street, London, W.1.

Liquidations

New Day Electrical Accessories, Ltd.—Winding up voluntarily. Liquidator, Mr. F. W. Hayward, 28, Queen Anne's Gate, London, S.W.1, appointed 10th October. This liquidation arises out of the re-arrangement of subsidiary companies of the Southern Areas Corporation, announced in our issue of 25th October.

Quality Radio, Ltd.—Particulars of claims by 19th November to the liquidator, Mr. A. W. Hunter, Walter House, 418-422, Strand, London, W.C.2.

Martin Electric (London), Ltd.—Particulars of claims by 22nd November to the liquidator, Mr. A. W. Hunter, Walter House, 418-422, Strand, London, W.C.2.

East African Electrical Imports

DURING 1956 the United Kingdom held its position as the main supplier of electrical goods to East Africa. Although this country's share of imports by Tanganyika decreased by 35 per cent to £670,908, and by 25 per cent to £860,381 in the case of Uganda, trade with Kenya increased by 47 per cent to £2,981,401. The main competition over the whole range of electrical equipment is encountered from West Germany, and in electronic products from Holland.

The accompanying table, which shows the principal imports during 1955 and last year, reveals the marked increase in telecommunication equipment and cables.

EAST AFRICAN ELECTRICAL IMPORTS (£000)

Product	Kenya 1955	Kenya 1956	Uganda 1955	Uganda 1956	Tanganyika 1955	Tanganyika 1956
Generators, motors, alternators, convertors, transformers, switchgear*	867	884	839	595	335	234
Lamps and torch batteries (excl. accumulators)	50	41	30	6	47	21
From *Malaya*	44	24	23	5	37	16
Ditto, n.e.s.	47	92	27	13	49	43
From *United Kingdom*	14	40	18	9	34	31
Bulbs, arc lamps and tubes for electric lighting, complete	54	73	20	9	30	26
From *United Kingdom*	22	44	10	5	10	11
,, *Holland*	28	23	7	3	12	13
Radio receivers, domestic	219	184	110	52	235	155
From *United Kingdom*	74	53	46	13	61	49
,, *Holland*	56	38	29	17	75	71
,, *West Germany*	81	84	29	21	92	33
Ditto, other, including components	122	164	41	28	100	40
From *United Kingdom*	98	143	34	26	87	32
Apparatus (other than radio) for telephony or telegraphy*	205	524	9	9	81	68
Electro-thermal apparatus, including domestic appliances	154	221	117	52	110	80
From *United Kingdom*	109	171	55	24	100	53
Measuring, controlling, safety and signalling apparatus*	34	47	17	27	13	25
Electro-medical apparatus*	17	16	5	9	8	10
Portable tools and appliances, including domestic	104	107	22	15	47	44
From *United Kingdom*	72	83	18	13	36	38
Insulated cables and wires*	255	509	231	114	112	156
Batteries for motor vehicles	119	124	68	28	115	51
From *United Kingdom*	59	87	48	22	98	39
Other machinery, appliances and apparatus, n.e.s.	122	347	149	231	61	74
From *United Kingdom*	91	317	143	226	47	61

* Mainly from United Kingdom.

NEW PATENTS Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) will be obtainable after 13th November from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1950

15773. Dirks, G.—Electric calculators. 23rd June, 1950. (786021.) (The list also includes Nos. 37201-6, 37208, 37210-23 and 37225-33, all of which are divided out of 786021 above.)

1952

23262. Young, S. G.—Electric switch operating mechanisms. 15th December, 1953. (786154.)

1953

22293. Muirhead & Co., Ltd.—Attenuators. 12th August, 1954. (786189.)

1954

8109. Standard Telephones & Cables, Ltd.—Electrical circuits employing static electrical switches. 11th March, 1955. (Addition to 663574.) (786056.)

18332. Raytheon Manufacturing Co.—Travelling-wave electron tubes. 22nd June, 1954. (786062.)

21393. Soc. Asservelec.—Apparatus for electrically coding information. 22nd July, 1954. (786352.)

22202. Central Electricity Authority, Hasler, E. F., and Spurr, G.—Apparatus for the measurement of radiation. 29th July, 1955. (786196.)

23156. Electric & Musical Industries, Ltd.—Cathode-ray tubes. 25th July, 1955. (786353.)

24320. General Electric Co., Ltd., and Cates, J.—Electric circuit arrangements for operating gas or vapour filled electric discharge lamps. 12th August, 1955. (786067.)

25793. General Electric Co., Ltd.—Information storage devices and materials handling apparatus including same. 6th September, 1955. (786199.)

26980. Imperial Chemical Industries, Ltd.—Electronic counters. 16th September, 1955. (786166.)

28329. Plessey Co., Ltd.—Electric circuits. 29th September, 1955. (786342.)

28775. Mackie & Co., Ltd., W., and Munns, S. A.—Speed regulating systems for d.c. motors and rotary convertors. 28th September, 1955. (786071.)

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30263. Central Electricity Authority, and Potter, E. C.—Apparatus for use in quantitative chemical determination processes. 20th October, 1955. (786272.)

31973. Submarine Cables, Ltd.—Submarine electric cables. 6th February, 1956. (786205.)

34065. Plessey Co., Ltd.—Electrical information storage apparatus. 2nd November, 1955. (786343.)

35453. General Electric Co., Ltd.—Electrically heated boilers. 6th December, 1955. (786206.)

35983. Philips Electrical Industries, Ltd.—Methods of manufacturing semi-conductor devices. 13th December, 1954. (786277.) 37658. Methods of manufacturing semi-conductor systems. 30th December, 1954. (786281.)

36396. Licentia Patent-Verwaltungs-Ges.—Electric temperature control device. 15th December, 1954. (786278.)

37213. Dirks, G.—Electronic computing means. 23rd June, 1950. (Divided out of 786021.) (786032.)

1955

1382. Hotpoint Electric Appliance Co., Ltd.—Alarm circuit for refrigerators and like pressure controlled temperature regulating devices. 17th January, 1956. (786076.)

3400. Philips Electrical Industries, Ltd.—Monitoring devices used in carrier-wave telephone systems. 4th February, 1955. (786079.)

4314. General Electric Co., Ltd.—Electric power supply networks. 12th January, 1956. (786082.)

6309. Philips Electrical Industries, Ltd.—Television receivers. 3rd March, 1955. (786085.)

6920. British Tabulating Machine Co., Ltd.—Multi-cathode tube counter circuits. 16th February, 1956. (786086.)

7234. General Electric Co., Ltd.—Ionisation counter tubes. 9th March, 1956. (786286.)

10442. International Business Machines Corporation.—Cathode-ray character tracer. 12th April, 1955. (786092.)

12779. Wagner Electric Corporation.—Voltage control devices. 3rd May, 1955. (786218.)

13109. British Insulated Callender's Cables, Ltd.—Manufacture of insulated electric cables. 4th May, 1956. (Addition to 749288.) (786220.)

17204. General Electric Co.—Electrodes for high-pressure gaseous arc discharge devices. 15th June, 1955. (786359.)

18272. Standard Telephones & Cables, Ltd.—Locking devices controlled by shock. 24th June, 1955. (786101.)

18475. Electric Storage Battery Co.—Separators for electric storage batteries. 27th June, 1955. (786298.)

18661. Siemens-Schuckertwerke Akt.-Ges.—Semi-conductor devices for producing a Hall voltage. 28th June, 1955. (786299.)

22249. Akustische und Kino-Gerate-Ges.—Dynamic microphone having a preferential response in one direction. 3rd August, 1955. (786111.)

28052. Proctor Electric Co.—Wattage controller system for electric heaters. 3rd October, 1955. (786121.)

30358. Metallges. Akt.-Ges.—Electrostatic precipitators. 24th October, 1955. (786313.)

30954. Smit & Co.'s Transformatorenfabrik N.V., W.—Electric transformers provided with cylinder windings. 28th October, 1955. (786126.)

33543. Pressed Steel Co., Ltd.—Refrigeration systems. 23rd November, 1955. (786369.)

34539. Western Electric Co., Inc.—Cable stranding apparatus. 2nd December, 1955. (786370.)

34806. Hazeltine Corporation.—Electric wave signal modifying apparatus. 5th December, 1955. (786236.)

35410. Standard Telephones & Cables, Ltd.—Selenium rectifier. 9th December, 1955. (786314.)

37439. Research Corporation.—Systems for energising electrostatic precipitators. 30th December, 1955. (786316.)

1956

890. Hoover, Ltd.—Clothes dryers. 10th January, 1956. (786134.)

5226. Busch-Jaeger Dürener Metallwerke Akt.-Ges.—Snap-action mechanism for rotary electric switches. 20th February, 1956. (786246.)

8082. Standard Telephones & Cables, Ltd.—Oil conservator for oil filled electrical equipment. 15th March, 1956. (786250.)

8620. Allmänna Svenska Elektriska Aktiebolaget.—Overvoltage protection device. 20th March, 1956. (786186.)

10044. Young, S. G.—Cord-operable electric switches. 15th December, 1953. (Divided out of 786154.) (786155.)

12945. Comptoir de l'Industrie Cotonniere, Etablissements Boussac.—Means for the control of electric motors driving winders for textiles. 27th April, 1956. (786257.)

1957

182. Western Electric Co., Inc.—Processes for treating fusible material. 7th December, 1954. (Divided out of 786170.) (786171.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 16th November:—

JUMBO (design). No. 764,377. Class 7. Electric welding machines. — Hauptmann K.G., Hamburg-Altona, Germany. Address for service, c/o J. Longman, Jessel Chambers, 88-90, Chancery Lane, London, W.C.2.

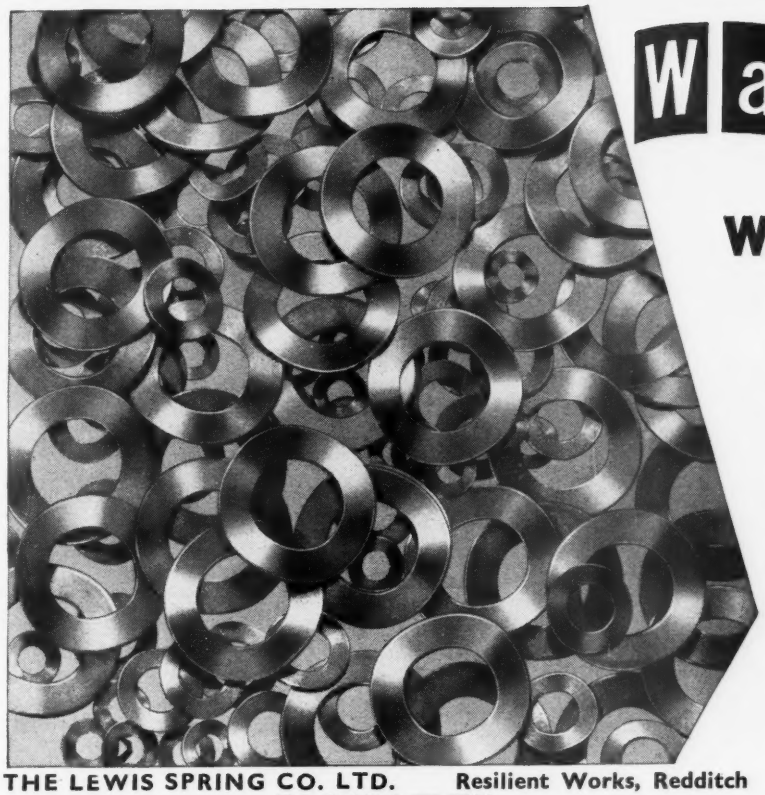
MAGNECLAIR. No. 764,632. Class 7. Electrical ignition devices for internal combustion engines; and current generators for use in the lighting of vehicles.—Société Anonyme A.B.G., Paris, France. Address for service, c/o Wilson, Gunn & Ellis, 57, Market Street, Manchester, 1.

DAWE. No. 760,934. Class 9. Measuring instruments, inspecting instruments; apparatus for use in automatically controlling the action of machinery or industrial plant; all being electronically operated; and parts.—Dawe Instruments, Ltd., 99, Uxbridge Road, Ealing, London, W.5.

WESTRONIC. No. 765,481. Class 9. Electrical and electronic apparatus for use in the supervision of electrical apparatus and for automatically controlling the operation of such apparatus; and parts.—Westinghouse Brake & Signal Co., Ltd., 82, York Way, King's Cross, London, N.1.

DECCAPRINT. No. 767,291. Class 9. Nautical, surveying, navigating, optical, radio, radar, television, signalling, teaching and measuring apparatus and instruments; electrical, electronic and scientific apparatus and instruments; and insulated electric cables.—Decca Record Co., Ltd., 1 and 3, Brixton Road, London, S.W.9.

PULSIMAX. No. 767,425. Class 10. X-ray apparatus. — Metropolitan-Vickers Electrical Co., Ltd., St. Paul's Corner, 1-3, St. Paul's Churchyard, London, E.C.4.



Wavey WASHERS

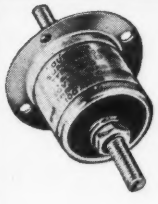
Beryllium Copper "Wavey" Washers. For Electronic Components. Range 8BA to ½. Corrosion resisting, non-damaging to components, higher resistance of "set", higher recovery of load, permanent spring action. They are fabricated from Beryllium copper, heat treated to VPN.350 minimum, Electro Plated to DTD.924, Cadmium Plated to DTD.904 and Passivated to DTD.923. Samples and price lists on request.

THE LEWIS SPRING CO. LTD. Resilient Works, Redditch
Tel: Redditch 720 PBX
London Office: 122 High Holborn, W.C.1 · Tel: Holborn 7470 & 7479

LEAVE IT TO **Lewis** OF REDDITCH
SPRINGS, SPRING CLIPS
PRESSWORK, WIRE FORMS
VOLUTE SPRINGS

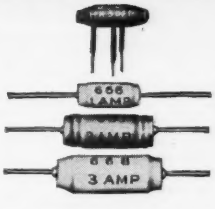
IN THE LEAD . . . .

. . and in the appliance



Bushing type interference suppressor of very low inductance for large motors and generators. Will suppress interference with Television and Radio reception.

Interference suppressor complying with B.S.613 and supplied to the Post Office. Suitable for suppression of interference to radio reception only.



Television interference suppressor kit for domestic electrical appliances.

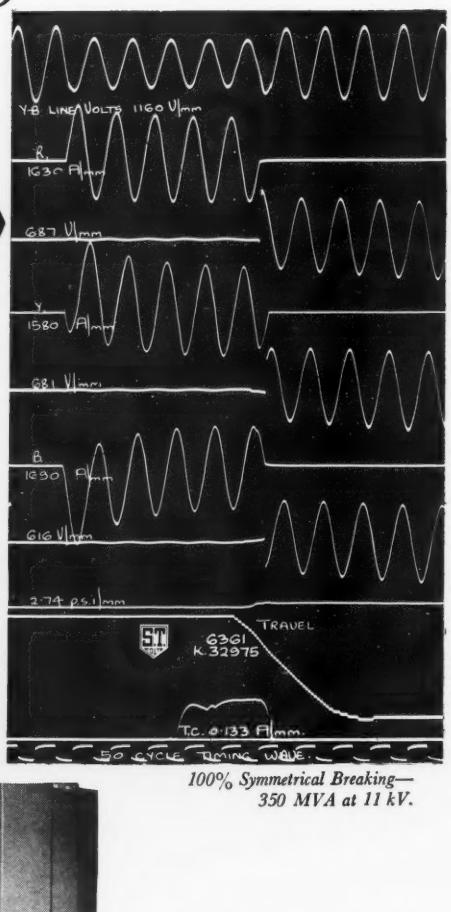
DUBILIER

CAPACITORS FOR INTERFERENCE SUPPRESSION

DUBILIER CONDENSER CO. (1925) LTD., DUCON WORKS, VICTORIA ROAD, NORTH ACTON, LONDON, W.3
Telephone: ACOrn 2241
Telegrams: Hivoltcon Wesphone London
DN 189

Here's proof of performance

This oscillogram shows the performance of a typical Metrovick VH metal enclosed switchgear unit. Note particularly the absence of arcing on the first major peak. Switchgear of this type is ideally suited for the control of heavy industrial services or power station auxiliaries.



100% Symmetrical Breaking—
350 MVA at 11 kV.

Breaking Capacity

150 MVA at 3.3 kV.
250 MVA at 6.6 kV.
350 MVA at 11 kV.

The illustration shows air insulated single busbar equipment, the same design can be compound filled single or double busbar type.

METROPOLITAN-VICKERS
ELECTRICAL CO. LTD · TRAFFORD PARK · MANCHESTER, 17

An A.E.I. Company

LEADING SWITCHGEAR PROGRESS

F/A 708

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 11th November

BIRMINGHAM. — College of Technology, 6 p.m. I.E.E. South Midland Supply and Utilisation Group. "Conduction and Induction Pumps for Liquid Metals," by Dr. L. H. Blake. (To be presented by J. A. S. Hilditch.)

BRISTOL.—At the S.W.E.B., 6 p.m. I.E.E., Western Centre. "Electrical Floor Warming," by J. W. Moule and W. M. Stevenson.

CHESTER.—Grosvenor Hotel, 7 p.m. I.E.E., Mersey and North Wales Centre. Annual dinner.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Informal meeting. Discussion on "Ought Electricity to be used for Space Heating in Domestic Premises? ", opened by D. J. Bolton.

White Hall Hotel, Bloomsbury Square, W.C.1, 6.30 p.m. A.S.E.E., Central London Branch. "Infra-red Heating," by H. S. Carter.

NEWCASTLE-UPON-TYNE. — Neville Hall, 6.15 p.m. I.E.E., North-Eastern Centre. "Cathodic Protection," by L. B. Hobgen, K. A. Spencer and P. W. Heselgrave.

SHEFFIELD. — Grand Hotel, 6.30 p.m. Institution of Production Engineers, East and West Riding Region. "Spark Erosion Process," by L. Adcock.

Grand Hotel, 6.30 p.m. I.E.S., Sheffield Centre. Presidential address by E. B. Sawyer.

Livesey Clegg House, 44, Union Street, 7.30 p.m. Junior Institution of Engineers, Sheffield and District Section. President's address, "Metals in the Modern World," by Professor A. G. Quarrell.

WEMBLEY PARK.—Century Hotel, Forty Avenue, 8.15 p.m. A.S.E.E., North West London Branch. "Application of the Cathode Ray Tube," by C. H. Gardener.

Tuesday, 12th November

BELFAST.—Queen's University, 6.30 p.m. I.E.E., Northern Ireland Centre. "Choice of Insulation and Surge Protection of Overhead Transmission Lines of 33 kV and Above," by A. Morris Thomas and D. R. Oakeshott.

BRADFORD.—Technical College, 6.30 p.m. I.E.E., North Midland Educational Discussion Circle. "The Teaching of Radio and T.V. Servicing," opened by Dr. G. N. Patchett.

CAMBRIDGE.—Cavendish Laboratory, Free School Lane, Cambridge, 8 p.m. I.E.E., Cambridge Radio and Telecommunication Group. "Some Radio Aids for High-Speed Aircraft," by Dr. J. S. McPetrie.

EDINBURGH.—Scottish Lyceum Gallery and Restaurant, 11, Atholl Crescent, 7.30 p.m. Edinburgh Electrical Society. "Fire Alarm Systems," by E. O. Chapman.

GLASGOW. — 39, Elmbank Crescent, Glasgow, 7 p.m. I.E.E., South-West Scotland Sub-Centre. "138 kV Submarine Power Cable Interconnection between the Mainland of British Columbia and Vancouver Island," by Dr. T. Ingledow, R. M. Fairfield, E. L. Davey, K. S. Brazier and J. N. Gibson.

HALIFAX.—White Swan Hotel, 7.30 p.m. Institution of Production Engineers, East and West Riding Region. "High Frequency Heating and Induction Hardening," by Dr. R. H. Barfield.

LONDON.—Café Royal, W., 7 for 7.30 p.m. I.E.E., Measurement and Control Section. Section dinner.

Savoy Place, W.C.2, 6.30 p.m. I.E.E., London Graduate and Student Section. "Manufacture of Electric Cables," by J. D. Navey.

Connaught Rooms, W.C., 12.30 for 1 p.m. Electrical Industries Club. Luncheon. Guest speaker, V. W. Dale.

Waterloo Bridge House, S.E.1, 5 p.m. Institution of Post Office Electrical Engineers. Informal meeting. "Recent Developments in the Cabling and Wiring of Telephone Exchanges," by T. F. A. Urben.

47, Belgrave Square, S.W.1, 5.30 p.m. Institute of Physics, Electronics Group. "Crossed Field Interaction in Microwave Valves," by W. E. Willshaw.

MANCHESTER. — Engineers' Club, Albert Square, 6.15 p.m. I.E.E., North-Western Utilisation Group. Informal discussion on "Repairing Electrical Plant," opened by J. Ashmore.

Engineers' Club, Albert Square, 7.15 p.m. Incorporated Plant Engineers, Manchester Branch. "Nuclear Power."

PORTSMOUTH. — Wiltshire Lamb Hotel, 7.30 p.m. A.S.E.E., Portsmouth Branch. "Water Heating Electrically," by L. E. Hughes.

READING.—The University, London Road, 7.15 p.m. A.S.E.E., Oxford, Reading and Districts Branch. "Motor Control Gear," by R. F. Mathieson.

SUNDERLAND.—Technical College. I.E.S., Newcastle-upon-Tyne Centre. "The Design of Lighting Glassware," by S. S. Beggs.

SWANSEA.—At the Royal Institution, 7 p.m. Institute of Metals, South Wales Local Section. "Nuclear Power," by L. Rotherham.

WORKINGTON.—College of Further Education, 7 p.m. I.E.E., North-Eastern Centre. District meeting. "Cathodic Protection," by L. B. Hobgen, K. A. Spencer and P. W. Heselgrave.

YORK.—Royal Station Hotel, 7.30 p.m. A.S.E.E., York Branch. "Electrode Boilers," by D. Stretton-Smith.

Wednesday, 13th November

BIRMINGHAM.—James Watt Memorial Institute, 6.30 p.m. I.E.E., South Midland Graduate and Student Section. "To Protect Electrical Circuits," by R. A. Marshall.

Birmingham Exchange and Engineering Centre, Stephenson Place, 7.30 p.m. A.S.E.E., Birmingham Branch. "Light Sources with Particular Reference to Electro-luminescence," by G. K. McNeil.

BRADFORD. — Midland Hotel, 7.30 p.m. A.S.E.E., Bradford Branch. "Electric Motor Control and Overload Protection," by S. H. Harding.

CARDIFF.—Angel Hotel, 7 p.m. Plastics Institute, South Wales and Monmouthshire Section. "Silicones—Their Manufacture and Applications," by C. J. Baker and D. W. R. Price.

GLASGOW.—39, Elmbank Crescent, 7.30 p.m. Institute of Marine Engineers, Scottish Section. "Developments in Marine Electrical Installations with Particular Reference to A.C. Supply," by A. N. Savage.

LANCASTER. — N.W.E.B., Demonstration Theatre, 7.15 p.m. I.E.E., North Lancashire Sub-Centre. "Electricity in Modern Commercial Horticulture," by C. A. Cameron Brown and A. W. Gray.

LIVERPOOL. — Picton Library, Liverpool Metallurgical Society. "Application of Inert Gas Electric Arc Welding," by P. J. L. Leder.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E., Radio and Telecommunication Section. "Broad-Band Slot-Coupled Microstrip Directional Couplers," "The Application of Printed-Circuit Techniques to the Design of Microwave Components" and "Re-Entrant Transmission Line Filter using Printed Circuits," by J. M. C. Dukes.

1, Birdcage Walk, Westminster, S.W.1, 6.45 p.m. Institution of Mechanical Engineers, Steam Group. Discussion on "Steam Conditions in Relation to the Size of Units."

NEWCASTLE-UPON-TYNE. — Neville Hall, Westgate Road, 6 p.m. British Institution of Radio Engineers, North Eastern Section. "Electronic Control of Machine Tools," by H. Ogden.

NORTHAMPTON. — College of Technology, 7.15 p.m. Northampton and District Electrical Association. "Floor Heating," by K. W. Bellamy.

OXFORD.—Southern Electricity Board, 37, George Street, 7 p.m. I.E.E. district meeting. "The Potentialities of Railway Electrification at the Standard Frequency," by E. L. E. Wheatcroft and H. H. C. Barton.

SOUTHAMPTON. — Southampton University Lecture Theatre, 6.30 p.m. I.E.E., Southern Graduate and Student Section. "Project Consideration of Diesel Electric Traction," by R. S. Wignall.

WOLVERHAMPTON. — Wolverhampton and Staffordshire Technical College, Wulfruna Street, 7.15 p.m. British Institution of Radio Engineers, West Midlands Section. "Cold Cathode Switching Techniques," by J. H. Beesley.

Wednesday, 13th November, to Wednesday, 27th November

LONDON.—Olympia. Building Exhibition.

Thursday, 14th November

BIRMINGHAM.—Midland Institute. I.E.E., South Midland Centre. "Some Engineering Problems in the Industrial Development of Nuclear Energy," by Sir Claude Gibb. (Joint meeting with Institutions of Civil and Mechanical Engineers.)

DUNDEE.—Electrical Engineering Queen's College, 7 p.m. I.E.E., North Scotland Sub-Centre. Chairman's address, by Prof. E. G. Cullwick.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E., Utilisation Section. "D.C. Winder Drives using Mercury-Arc Rectifier/Inverters," by L. Abram, J. B. McBreen and J. Sherlock.

At the Royal Institute of British Architects, Portland Place, W.1, 6 p.m. Illuminating Engineering Society. "School Design," by D. L. Medd.

Connaught Rooms, Great Queen Street, W.C.2, 6.45 for 7.15 p.m. Public Transport Association. Annual dinner.

MANCHESTER. — College of Technology, 6.30 p.m. British Institution of Radio Engineers, North Western Section. "Some Electronic Techniques Used in Textile Research," by J. B. Todd.

NEWCASTLE-UPON-TYNE.—Roadway House, Oxford Street, 7 p.m. Incorporated Plant Engineers, North East Branch. "Steel Production by Modern Methods," by G. E. Hemming.

SWANSEA. — Conference Rooms, South Wales Electricity Board Showrooms, The Kingsway, 6 p.m. I.E.E., West Wales (Swansea) Sub-Centre. "The Measurement of Earth-loop Resistance," by Dr. G. F. Tagg.

WIMBLEDON.—Prince of Wales Hotel, S.W.19, 7.45 p.m. A.S.E.E., South West London Branch. "Electricity Supply to the London Underground System," by H. L. Buckman.

Friday, 15th November

ABERDEEN. — Robert Gordon's Technical College, 7.30 p.m. I.E.E., North Scotland Sub-Centre. Chairman's address, by Prof. E. G. Cullwick.

LEEDS.—Queen's Hotel, 7 for 7.30 p.m. I.E.E., North Midland Centre. Annual dinner.

LONDON.—Savoy Hotel, W.C.2, 6.30 p.m. Association of Electrical Machinery Trades. Annual ball.

Feathers Hotel, Broadway, Westminster, 6 p.m. Electrical Trades' Commercial Travellers' Association. Annual general meeting.

A.S.E.E., West London Branch, 6.15 p.m. Theatre and supper (London Palladium).

1, Birdcage Walk, Westminster, S.W.1, 6 p.m. Institution of Mechanical Engineers. Thomas Hawksley Lecture. "Vibration: A Survey of Industrial Applications," by Professor J. P. den Hartog.

Saturday, 16th November

OXFORD. — Regent's Park College, Pusey Street, 7 p.m. A.S.E.E., Oxford, Reading and Districts Branch. "Transformer Construction and Design."

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—Department of Civil Aviation. 12th November. Line voltage regulators. (E.S.B. 25756/57. Ten/28807.)*

Electricity Commission of New South Wales, Sydney. 25th November. 132 kV single circuit steel tower transmission line. (E.S.B. 25761/57. Ten/28812.)* 17th March. Three 860,000 lb/hr and two 1,350,000 lb/hr reheat boilers. (E.S.B. 25762/57. Ten/28813.)*

P.M.G.'s Department, Melbourne. 5th December. 12-channel open-wire carrier telephone equipment. (E.S.B. 25635/57. Ten/28763.)*

Basildon.—U.D.C. 20th November. Street lighting equipment. (See this issue.)

Brazil.—Central Elétrica de Furnas S.A. Companies wishing to be considered for the construction of a 1,100,000 kW hydro-electric power station to be built on the Rio Grande should apply by 14th November. Conditions are available from Canadian Brazilian Services, 148, Leadenhall Street, London, E.C.3. (E.S.B. 9697/57. Ten/28927.)*

State Electricity Commission, Porto Alegre. 3rd April. One 25,000 kW turbo-alternator unit, two boilers, and electrical equipment, including transformers for Sao Jeronimo power station. (E.S.B. 26032/57. Ten/28901.)*

Canada.—Manitoba Hydro-Electric Board. 26th November. 4,160 V metalclad switchgear. (E.S.B. 25827/57. Ten/28922.)*

Ceylon.—Department of Government Electrical Undertakings, Colombo. Plant including 25,000 kW turbo-alternator, boiler switchgear, etc., for Grandpass power station. (See this issue.) Civil engineering work, pipelines, mechanical and electrical plant, including two 25,000 kW alternators, transformers, etc., and 132 kV transmission lines. (See this issue.)

Colwyn Bay.—Corporation. 30th November. Trunk road lighting equipment. (See this issue.)

Coulsdon and Purley.—U.D.C. 25th November. Trunk road lighting. (See this issue.)

Edinburgh.—North of Scotland Hydro-Electric Board. Main and auxiliary cabling installation for Lochay power station. (See this issue.)

Epsom and Ewell.—Corporation. 7th December. Three electrically operated pumps. (See this issue.)

Esher.—U.D.C. 26th November. Street lighting equipment. (See this issue.)

India.—Director General of Supplies and Disposals, New Delhi. 13th November. Distribution cable. 21st November. House wiring cable. (E.S.B. 25765-6/57. Ten/28809-10.)*

India Store Department, London. 12th December. D.c. welding generators. (See this issue.)

Iraq.—Central Foreign Purchasing Board, Baghdad. 23rd November. Electrical laundry plant. (E.S.B. 25942/57. Ten/28852.)*

Development Board and Ministry of Development. Emergency diesel generator for Basrah power station. Particulars from Embassy of Iraq, London, or Ewbank & Partners, 10-11, Grosvenor Place, London, S.W.1. (E.S.B. 26339/57. Ten/28937.)*

Leicester.—Education Committee. 21st November. Electrical installation at Melton Road Secondary School. J. H. Lloyd Owen, city architect, 10, Loseby Lane.

Lowestoft. — Borough Council. 22nd November. Supply and erection of 37 group "A" sodium lighting units on concrete columns, and removal of existing lighting and columns, St. Peter's Street. Borough engineer, 49, High Street.

New Zealand.—G.P.O., Wellington. 29th November. Power relays. (E.S.B. 25855/57. Ten/28802.)* 6th December. Crystal holders. (E.S.B. 25853/57. Ten/28830.)*

Patchway.—Parish Council. 2nd December. Street lighting equipment. (See this issue.)

Salvador.—Proceduria General de la Republica. 13th November. One 5 kW transmitter. (E.S.B. 25677/57. Ten/28805.)*

South Africa.—Stores Department, South African Railways, Johannesburg. 13th November. One 6·6 kV 3-panel switchboard. (E.S.B. 25918/57. Ten/28847.)* 15th November. Electric cable. (E.S.B. 25895/57. Ten/28849.)* 20th November. Mild steel conduit. (E.S.B. 25920/57. Ten/28887.)* 22nd November. Single channel carrier equipment. (E.S.B. 25921/57. Ten/28911.)* 27th November. Electric light buoys. (E.S.B. 25924/57. Ten/28920.)* 29th November. Cold cathode lighting fittings. (E.S.B. 25899/57. Ten/28874.)*

Transvaal Provincial Administration, Pretoria. 15th November. Three electrically-driven welding sets and two 10 kW diesel-driven generating sets. (E.S.B. 25871 and 25875/57. Ten/28819-20.)*

Union Tender and Supplies Board, Pretoria. 14th November. Portable v.h.f. transmitter-receivers and air transportable radio equipment. (E.S.B. 26424/57. Ten/28959.)*

United States.—Bureau of Reclamation, Denver. 3rd December. Motor control equipment. (E.S.B. 25333/57. Ten/28904.)*

Uruguay.—Administracion General de las Usinas Electricas y los Telefonos del Estado. 4th December. Transformer substation equipment. (E.S.B. 25477/57. Ten/28776.)* 5th December. Ratio transformers. (E.S.B. 25507/57. Ten/28760.)* 6th December. Power transformers and accessories. (E.S.B. 25508/57. Ten/28777.)*

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Chelsea.—Works and Highways Committee. Recommended. Lighting of all Class "A" roads (including guard posts, traffic signs, etc.), with class "B" lighting in Chelsea Manor Street (£77,574).—General Electric Co.

Glasgow.—Education Committee. Electrical work at Garthamlock Secondary School, Site No. 5 (£20,602).—J. B. Meiklejohn. Electrical work at primary schools at Garthamlock, Sites Nos. 2 and 8 (£6,042) and Easterhouse (£9,122).—Mobile Electric Services.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Birmingham.—Works, Great Lister Street; Birmingham Lithocraft, Ltd., 155, Heneage Street.

Houses (70), Glenavon Road, King's Heath; A. G. Sheppard Fidler, city architect, City Centre.

Burton-on-Trent.—Flats (32), Waterside House; borough architect.

Camborne.—Police headquarters at Veor (£18,000); S. Gregson, Cornwall county architect, County Hall, Truro.

Cheltenham.—Bakery, Kingsditch Lane; Associated Gloucestershire Bakeries, Ltd., 21, St. George Street, Bristol.

Chertsey.—Erection of two laboratories, additional classrooms and kitchen at Sir William Perkins Girls' School (£51,450); J. Harrison, county architect, County Hall, Kingston-on-Thames.

Corby.—Houses (84), Farmstead estate; Development Corporation, Fineshade Abbey, Duddington.

Crawcrook.—R.C. church and presbytery; J. & W. Lowery, Corporation Street, Newcastle.

Darlaston.—Houses (48), Attlee Road; C. R. Whitmore, surveyor to U.D.C., 49, Church Street, Darlaston, Staffs.

Fleetwood.—Houses (70), West View estate; borough engineer, Town Hall.

Gillingham (Kent). — Community and maternity and child welfare centre, Twydall Green (£18,400); F. Hill, town clerk, Municipal Buildings.

Gipping.—Houses (28), Needham Market; E. Harwood, clerk to R.D.C., Council Offices, Needham Market, near Ipswich.

Golborne.—Houses (52), Culcheth; J. B. Hoyle, surveyor, Council Offices, Lowton, near Warrington.

Harlow.—Factory for De Havilland Aircraft Co.; John Laing & Son, Ltd., Bunns Lane, London, N.W.7.

Hebburn.—R.C. grammar technical school at Mill Lane (660 places); R. Burke, architect, Lambton House, Lambton Road, Newcastle-on-Tyne.

Leicester.—New Gold Hill Secondary Modern School (£108,785) in 1958-59 programme; county architect, Leicester.

Leyton.—Factory, Lea Bridge Road; S. Grant (Furniture), Ltd., Harrow Road, E.11.

London.—New kitchens, dining rooms, administration block, operating theatres, etc., at Lambeth Hospital, Brook Drive, S.E.11 (£192,570); South West Metropolitan Regional Hospital Board, 11, Portland Place, W.1.

Middlesbrough.—Additions in Wilton Street for E. Turner, Ltd.; Kitching & Co., architects, 21, Albert Road.

Office block, Wilson Street and Dundas Street; Danderson, Townend & Gilbert, estate agents, 88, Borough Road, Middlesbrough.

Morpeth.—Houses (70), Splevit Lane; A. Robertson, Blyth.

Stockport.—Infants' school (240 pupils), Brinnington; borough architect, Town Hall.

Stretford.—Canteen, offices and laboratory, Trafford Wharf Road; British Oil and Cake Mills, Ltd., Trafford Wharf Road, 17.

Meter factory, Talbot Road; Parkinson & Cowan, Ltd., Talbot Road.

Tynemouth.—Fire station and ambulance station (£120,000); K. Jordan, Alexandra Road, North Shields.

Wallsend.—Blocks of flats; borough surveyor.

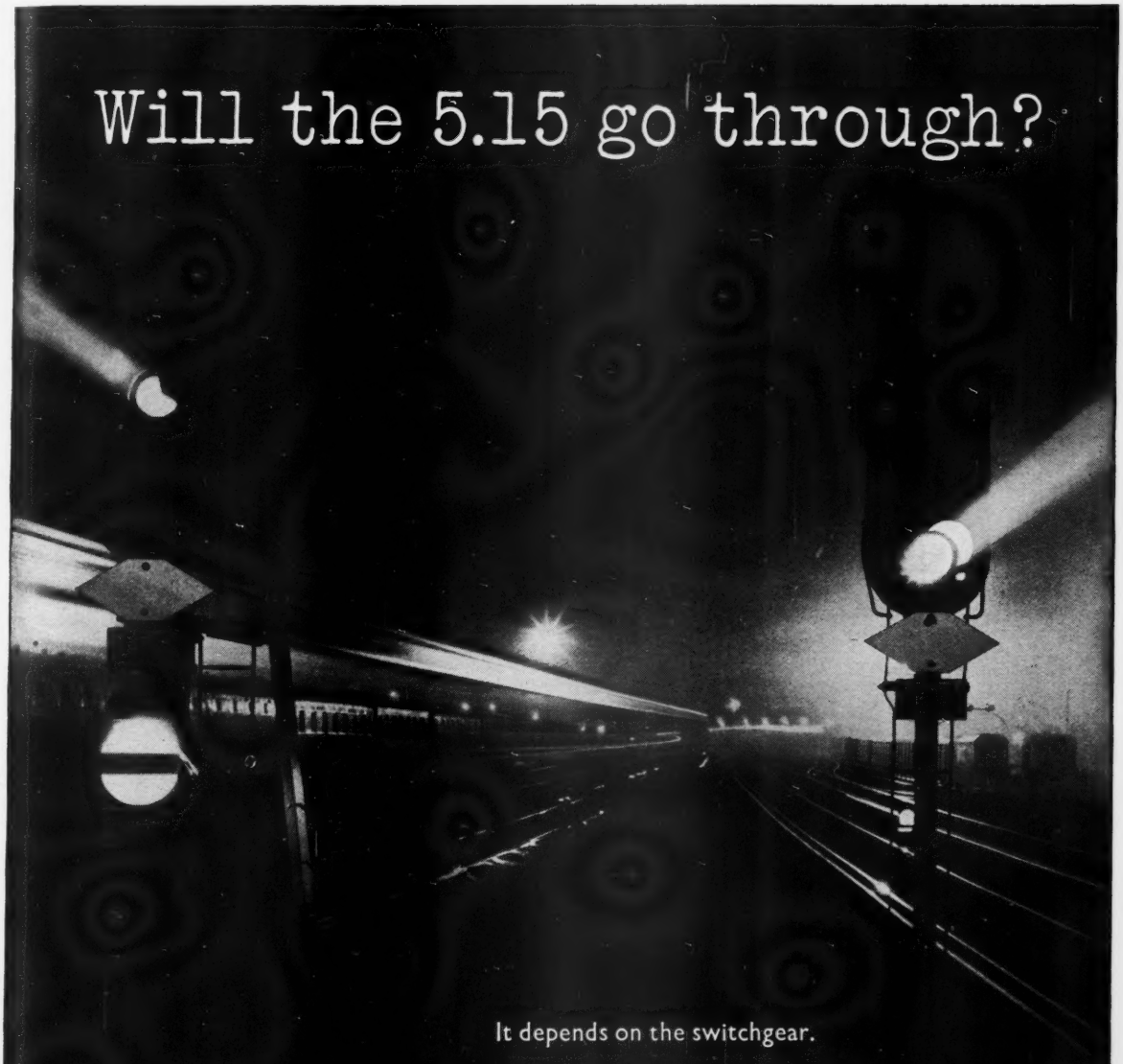
Ten shops, Low Willington Farm estate; J. H. James, builder, Archer Street, Wallsend.

West Hartlepool.—Houses (114), Owton Manor estate; G. M. Pearson & Son, builders, Front Street, Hetton.

Weymouth.—Ritz theatre and ballroom; Verity & Beverley, architects, 35, Doughty Street, London, W.C.1.

Wisbech.—Second stage of College of Further Education; Bettles Building Co., Ltd., Alma Road Works, Millfield, Peterborough.

Will the 5.15 go through?



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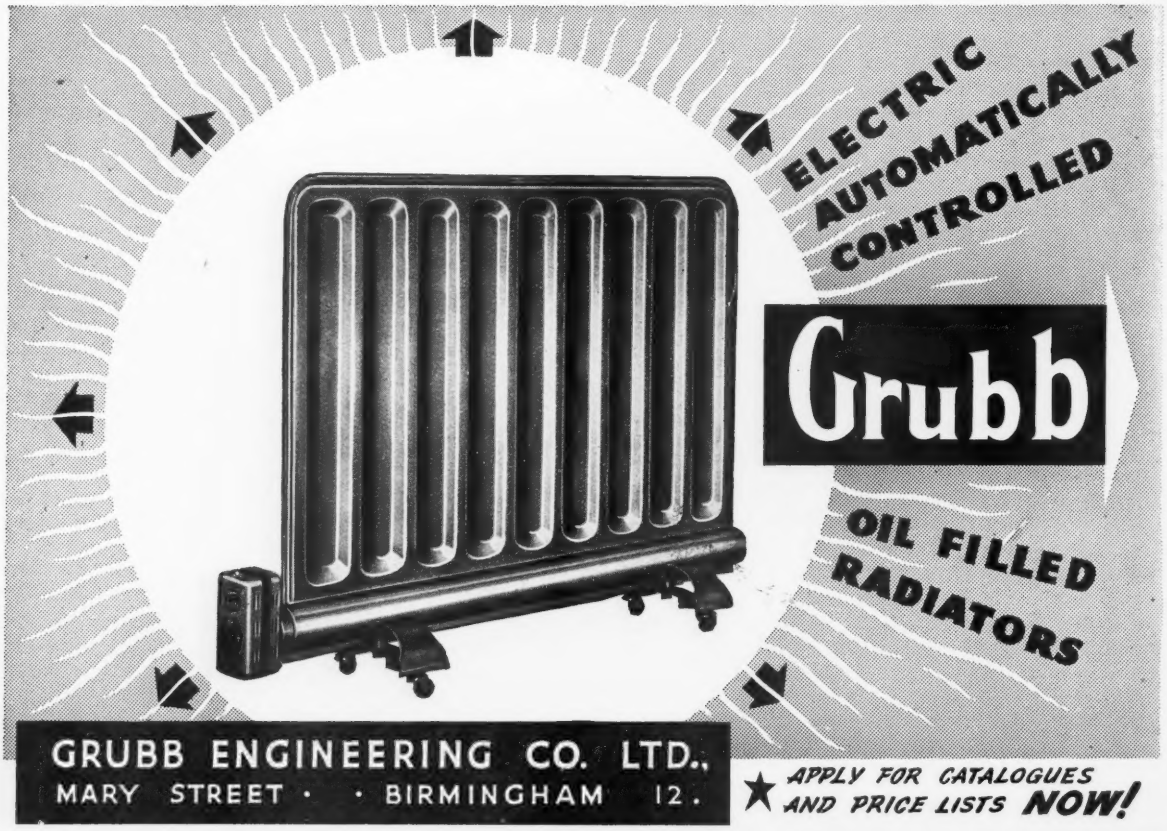

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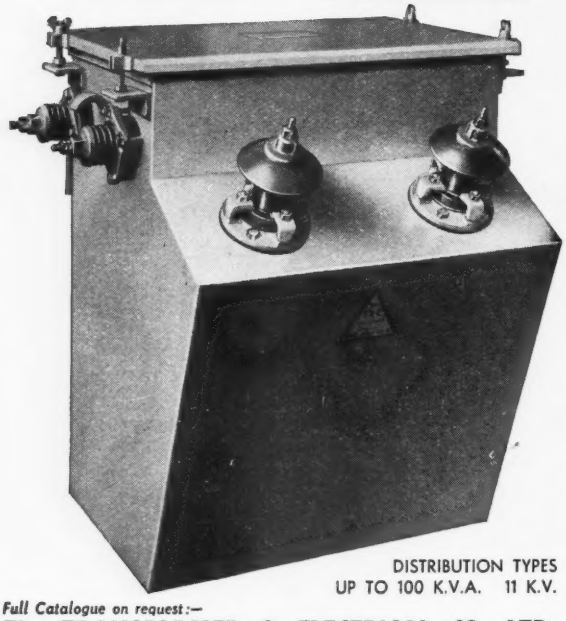

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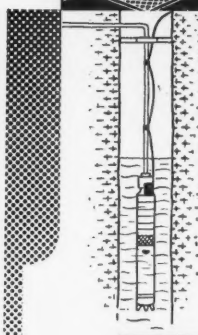

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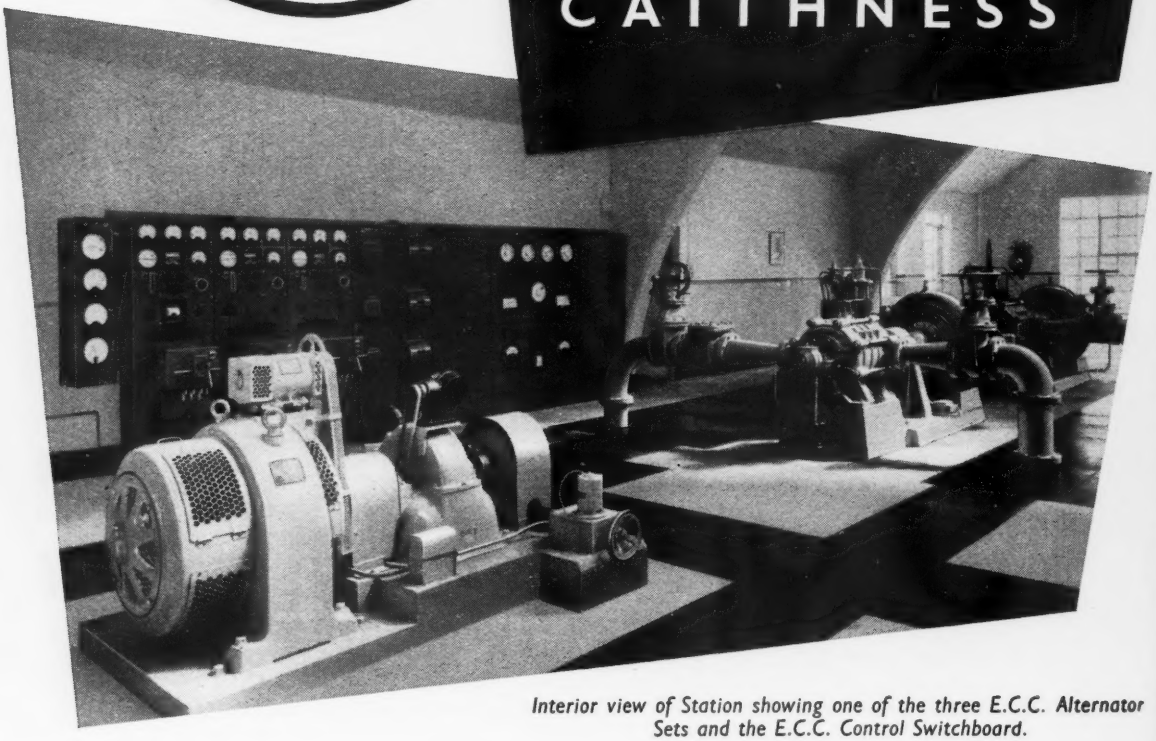

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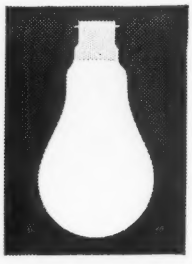

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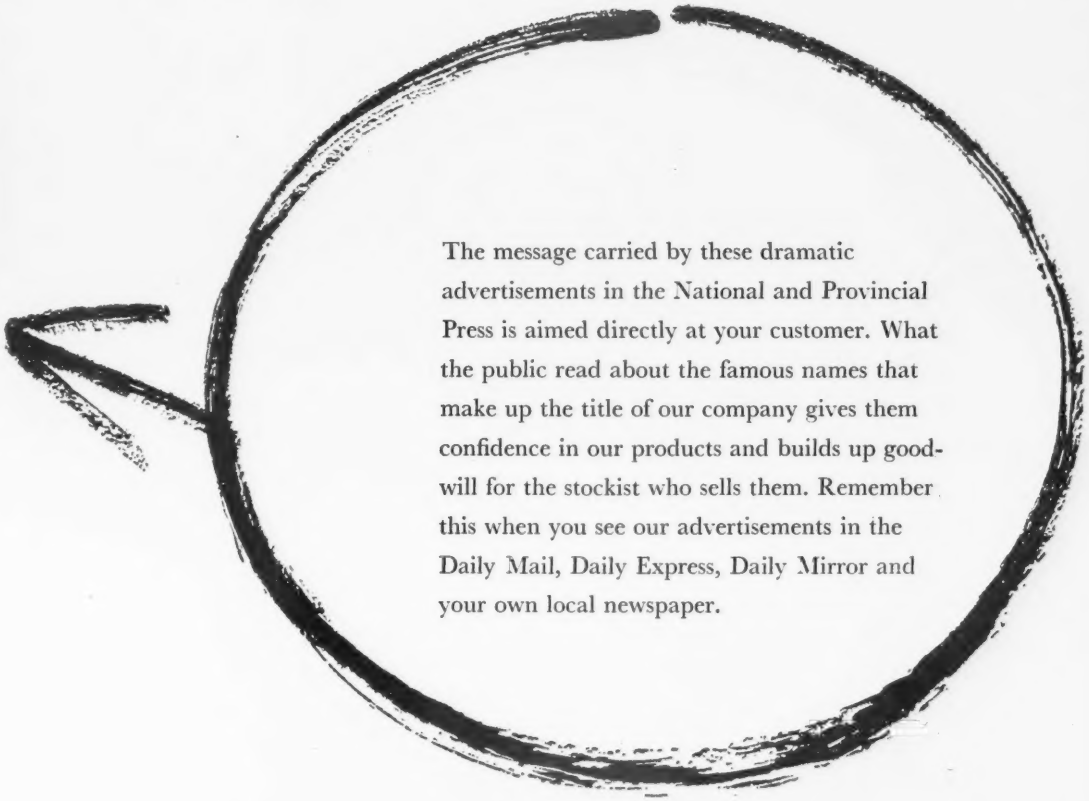

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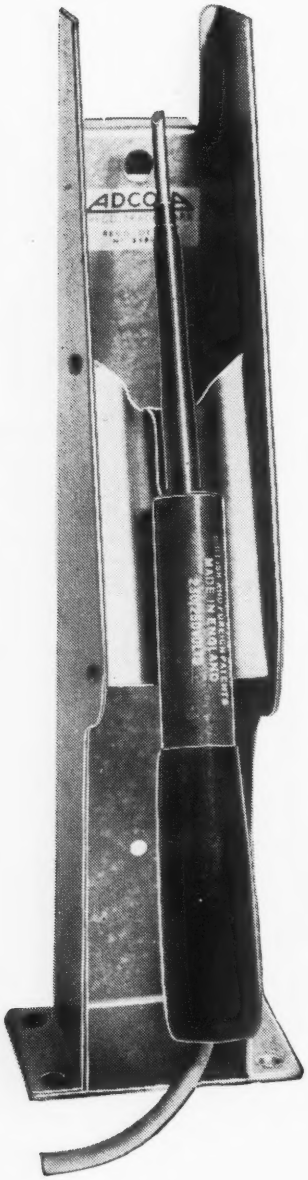

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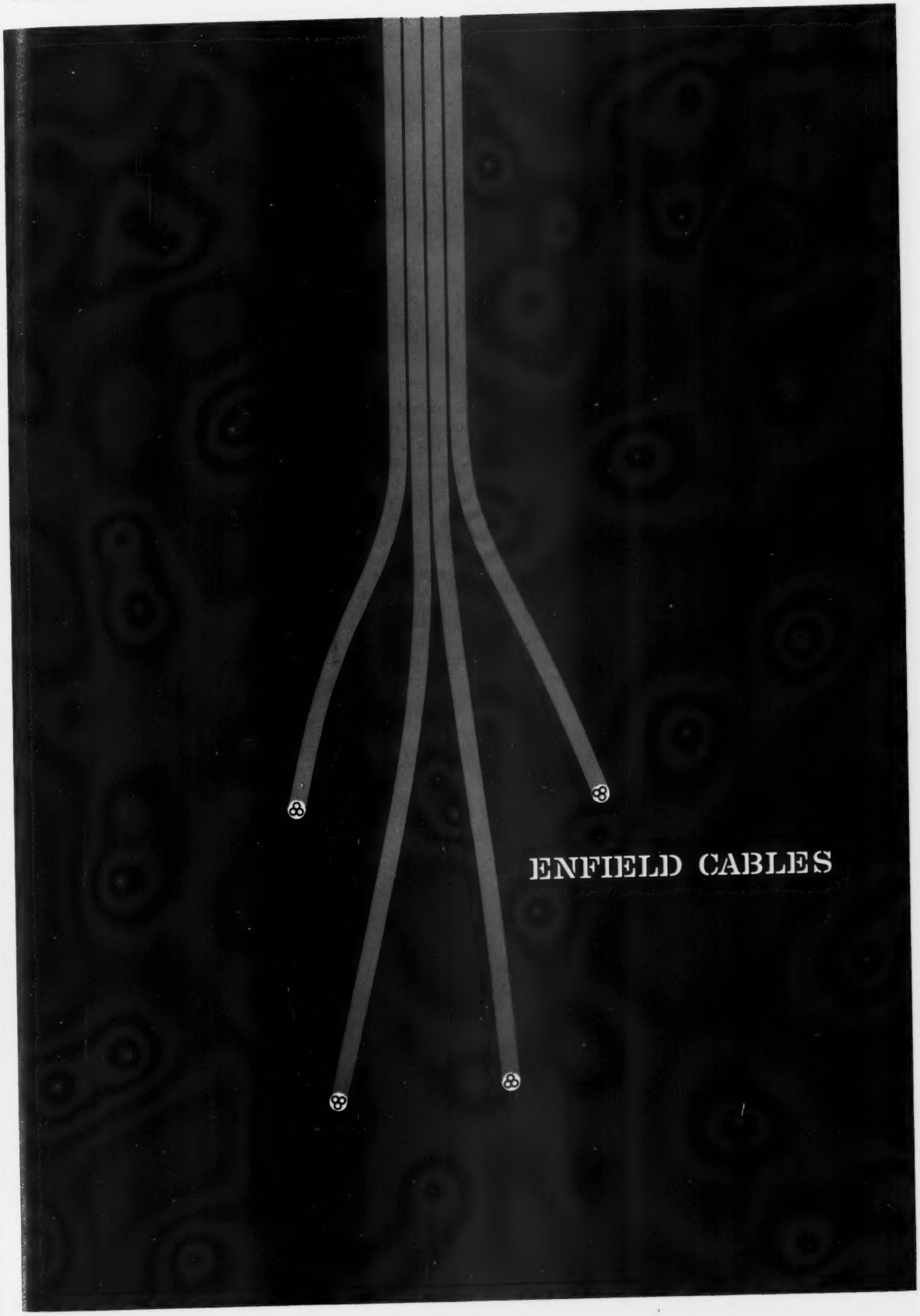
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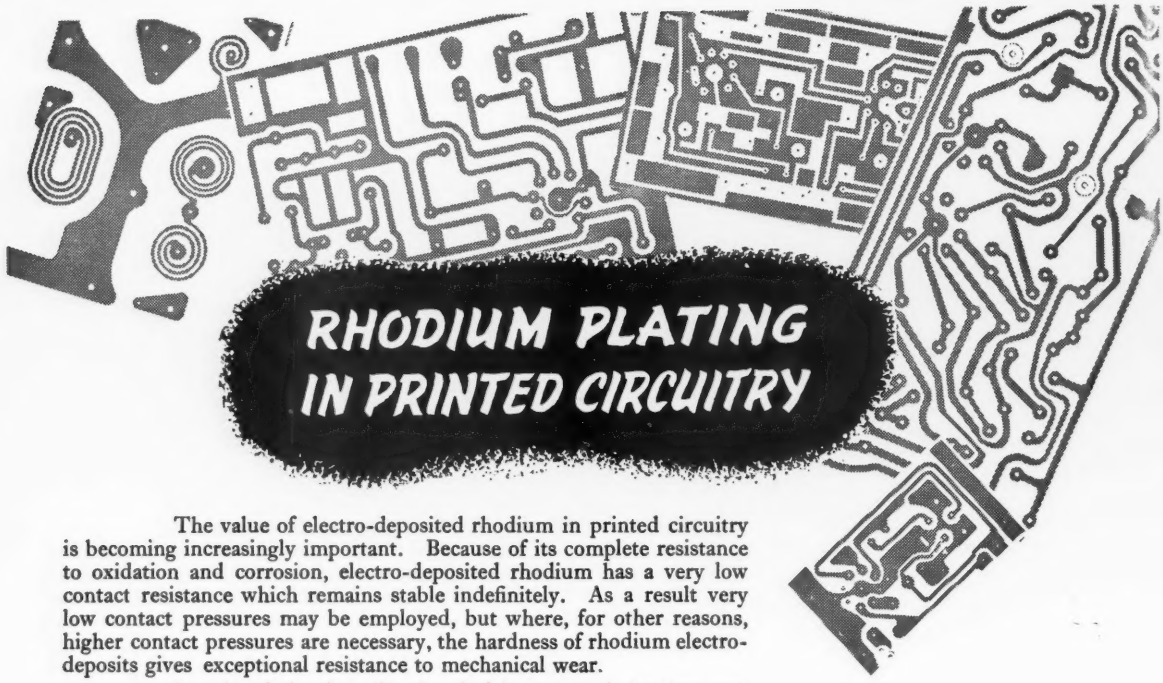

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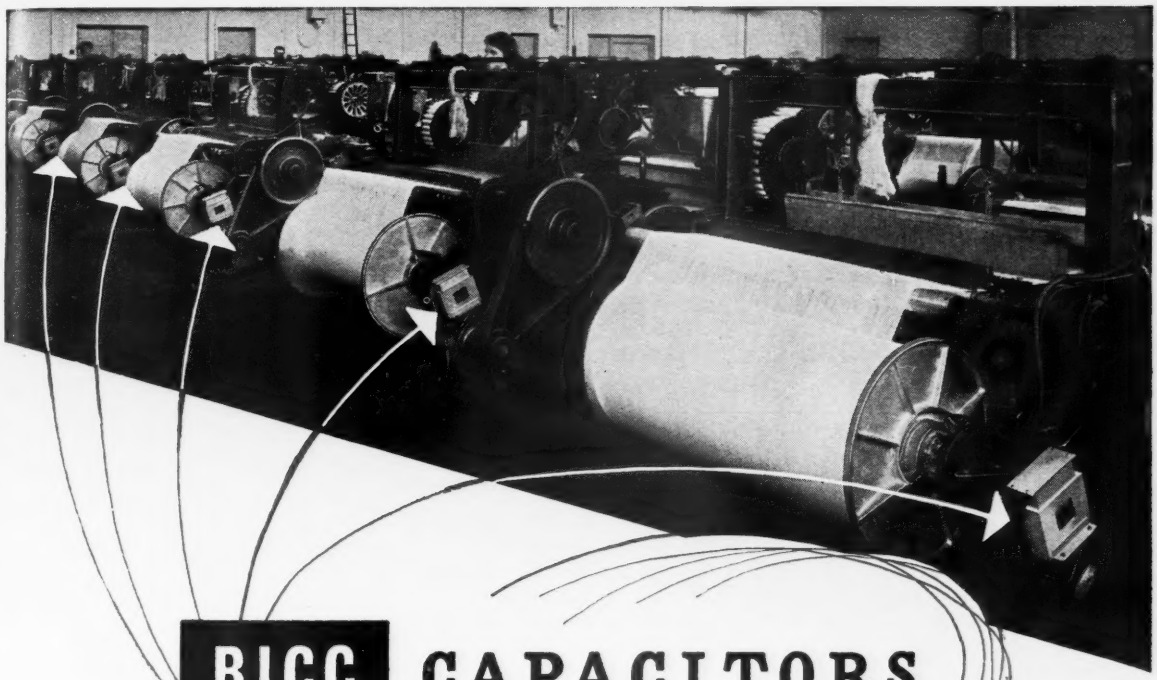

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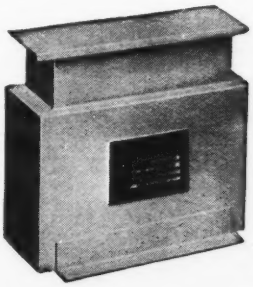

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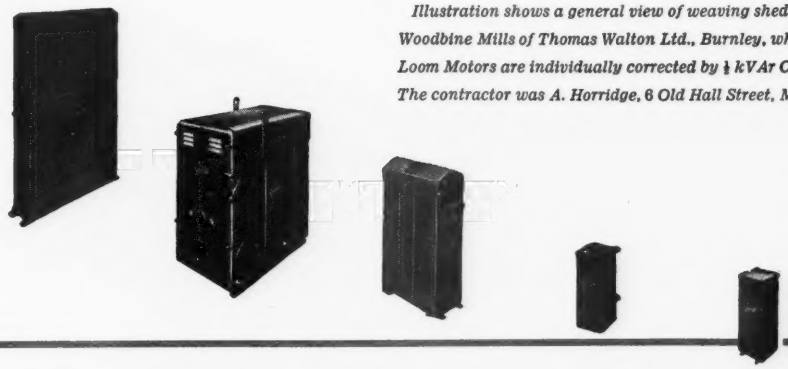

Illustration shows a general view of weaving shed in the Woodbine Mills of Thomas Walton Ltd., Burnley, where 192—¼ H.P. Loom Motors are individually corrected by ¼ kVAr Capacitors. The contractor was A. Horridge, 6 Old Hall Street, Middleton.

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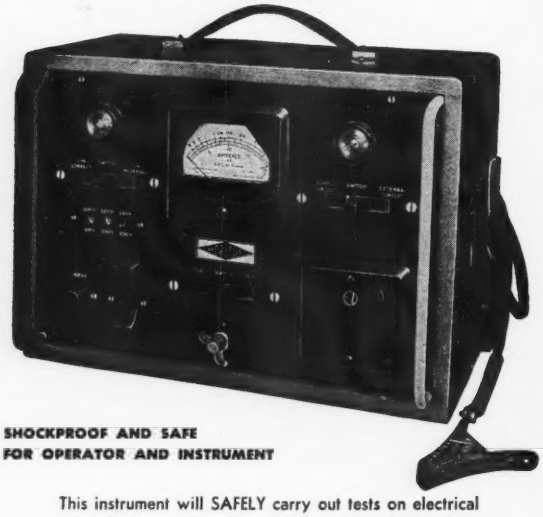

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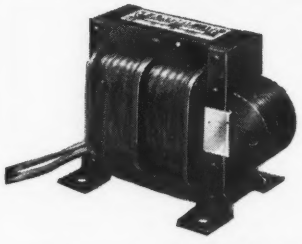

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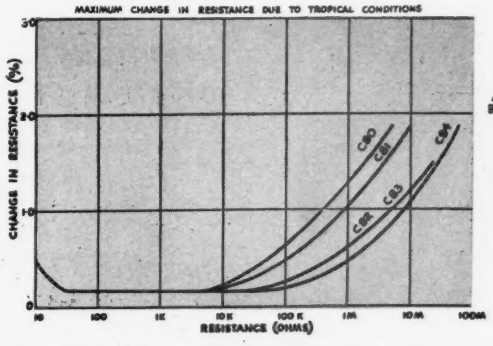

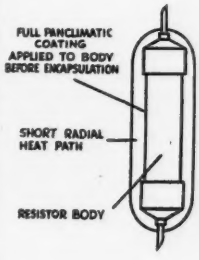

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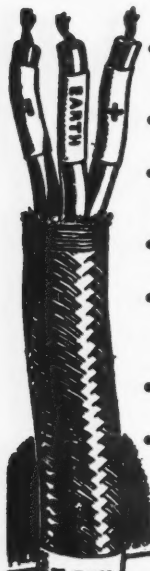

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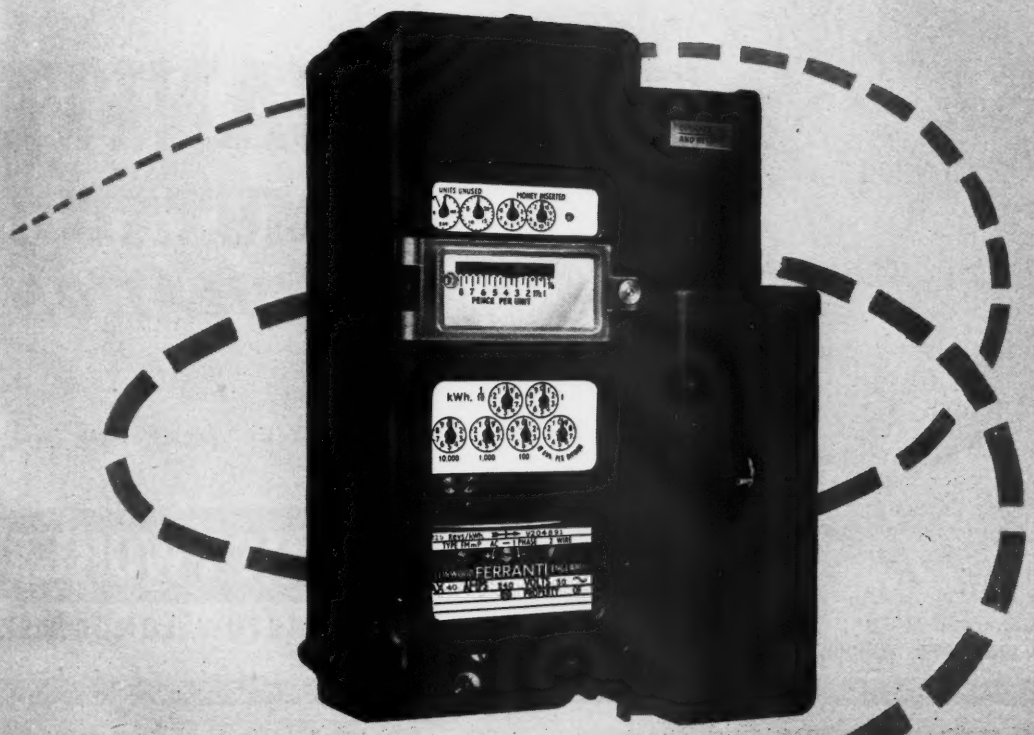

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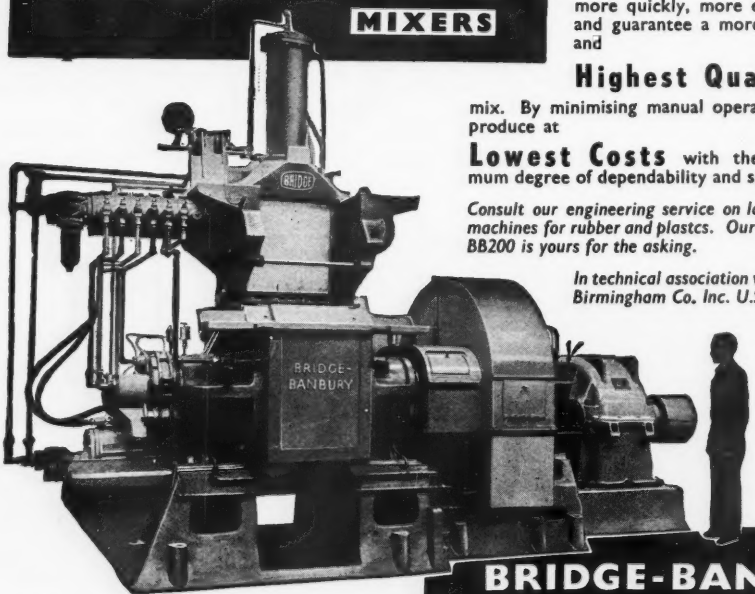

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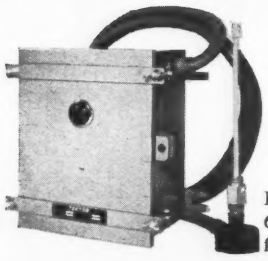


British Patent Nos. 697253 645732 and foreign equivalents.

TELSTOR *Controls* LEVEL

OF ALL LIQUIDS AND SOLIDS

- Low Initial cost.
- Simple Installation.
- No moving parts in the container.
- Direct contact with material unnecessary.
- Can be used on all liquids or free flowing solids regardless of conductivity, insulating value, corrosive properties, or various process conditions.
- **Weatherproof and flameproof models available.**

A range of electrodes has been developed to suit every application. Send for leaflets 203 & 252/ER.

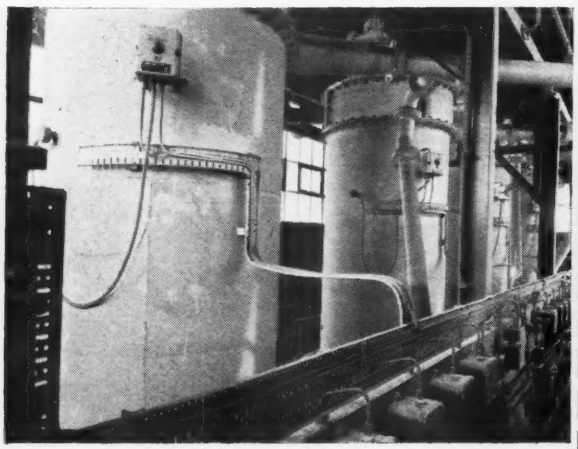
British Patent No. 772253

TEKTOR *Indicates* LEVEL

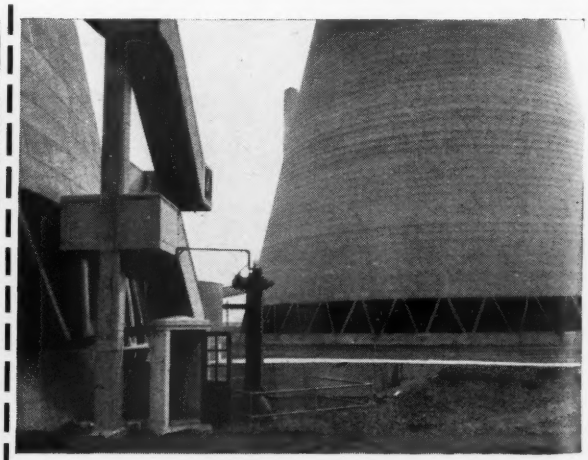
OF ALL LIQUIDS AND SOLIDS

- Universally applicable.
- No moving parts.
- Accurate and stable.
- Simple to install.
- Remote indication up to ½ mile away, if required.
- **Flameproof models available.**

Telstor electrodes reach from top to bottom of the container and in the case of rope electrodes are terminated by a weight. Send for leaflet 223/ER.



Tektor controls level in dust cyclones at Ince Power Station.



Telstor gives continual level indication on cooling towers at Ince Power Station.

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Model EP.802
TWIN 80 WATT
Suspended or Ceiling Fitting with Opal Fluted "Perspex" Diffusing Cover

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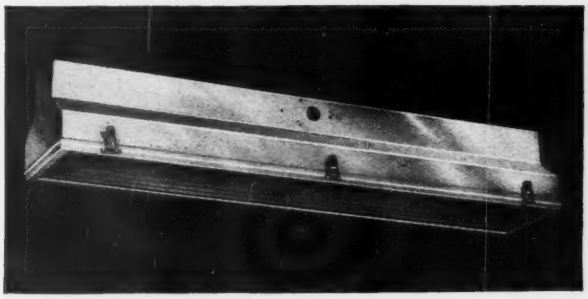

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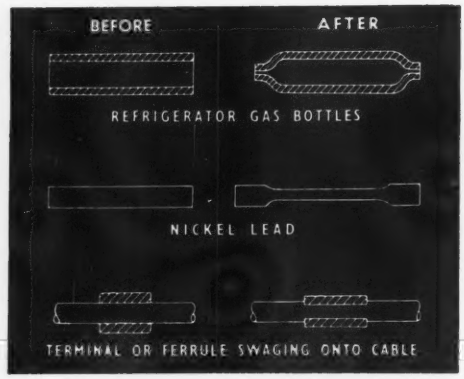
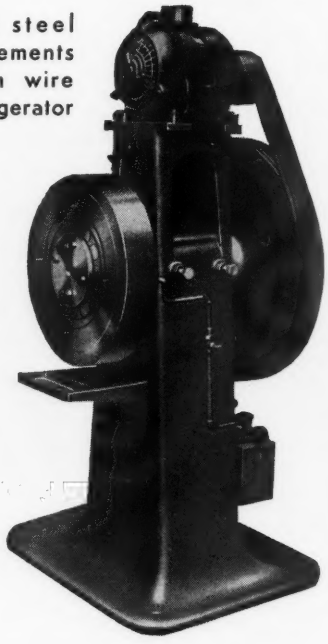
It is a means of reducing or pointing tube and rod by a hammering process



Reducing powder filled steel inconnel and copper elements Tungsten and Molybdenum wire for filaments. Necking refrigerator gas bottles.



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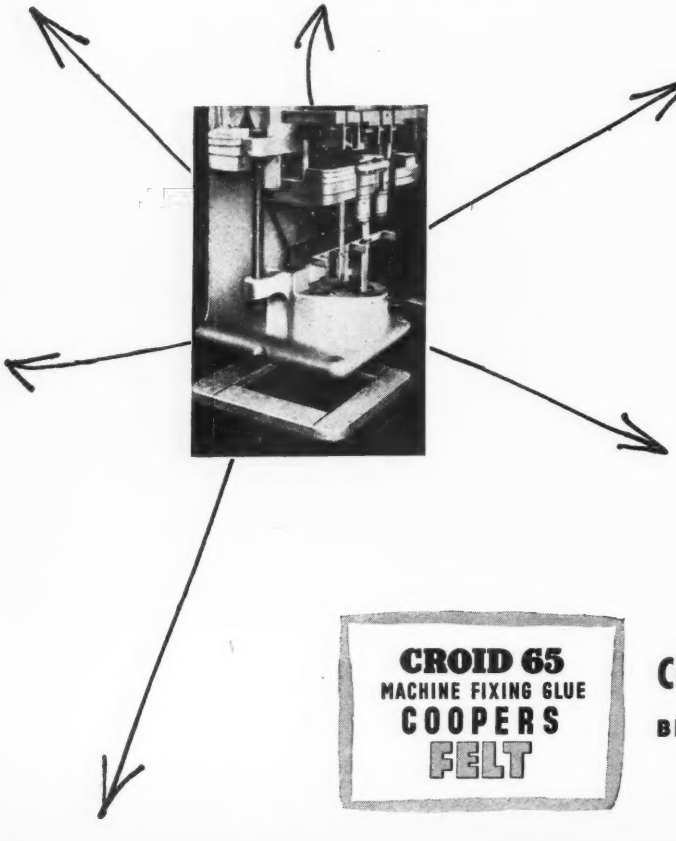

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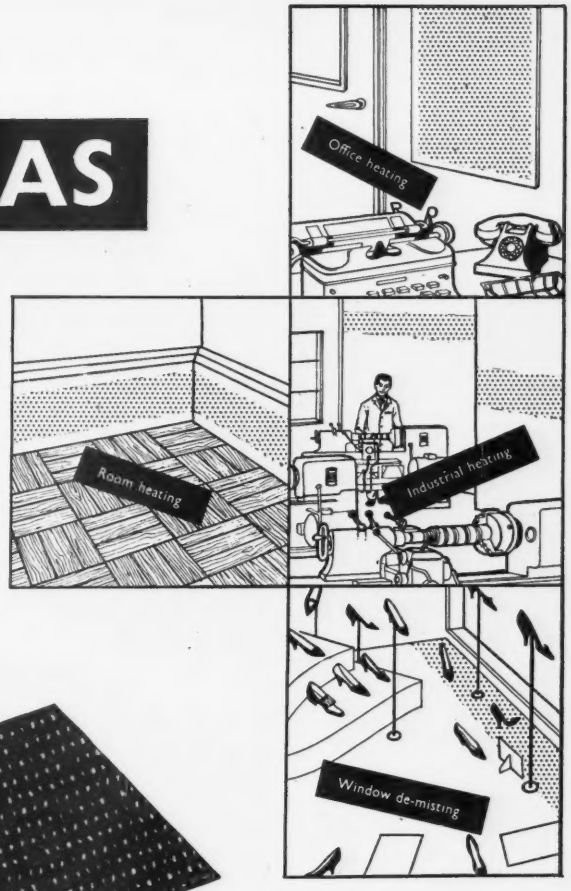
The New Non-metallic Heating Element

Mhoglas is a completely new departure in the area-heating field—new working principle, new materials, new manufacturing techniques. Its many qualities, particularly its complete safety, make it an attractive proposition for the space heating of buildings. Here the element could be incorporated in floors, walls or skirting boards or even in wooden, plastic or rubber panels.



Some Mhoglas features

1 Provides even, "solid" heat without hot spots or tracks.
2 It is light, flexible, non-metallic and made in thin sheets.
3 Can suffer local damage without element failure and is thus inherently "safe."
4 May be shaped, cut and formed, potted, laminated, and incorporated in wood, plastics, rubber, concrete and metal.
5 May be curved to radii of 1½" or as low as ¼" during manufacture.
6 May be thermostatically controlled, directly or remotely.

Mhoglas can be supplied in all lengths and in widths up to 12"

It is produced and marketed by Hunting Mhoglas Ltd. who welcome your enquiries.

HUNTING MHOGLAS LIMITED *A Hunting Group Company*

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AP/10

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From -55°C to 200°C

Rigorous tests of STERLING V. 304, Modified Silicone Varnish, at these temperature extremes, under 6G vibration conditions and high humidity prove fitness for purpose. This reversible series type actuator motor, made by The Plessey Co. Ltd., operates in high ambient temperatures, and, under varied conditions of flight, withstands extreme cold. This is just another example of STERLING'S ability to meet the customer's requirements; no matter how exacting they may be, STERLING will find the answer.

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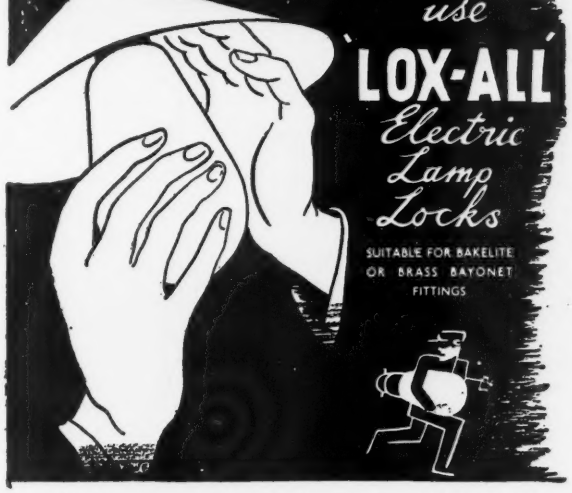

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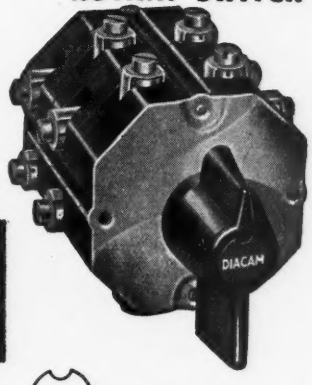

This shows the patent terminal clamp securing two conductors

MOTOR FAN Nº3

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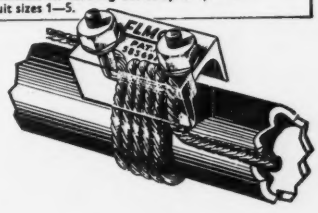
A COMPLETE RANGE TO B.S.951. 1948 IN 4 SIZES

	A123	B45	C67	D8910
for earthing cables up to	7/0.036"	7/0.064"	19/0.064"	19/0.083"
to fit B.S. conduit sizes	1, 2 & 3	4 & 5	6 & 7	8, 9 & 10
I.e. in trade terms	¼" to ¾"	1" and 1¼"	1½" and 2"	2½" to 3½"

NOTE ALSO: Type A123 is suitable for Earthing Cables up to 7/0.029" and for B.S. conduit sizes 1—5.

"Elmo" Earthing Clamps are of robust construction. Impossible for wire to pull out, always under tension, therefore a most satisfactory earth and a permanent safeguard.



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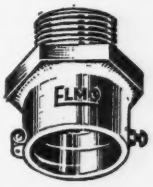
Flexible-to-rigid
CONDUIT COUPLINGS

Made in zinc base alloy in the following sizes

Electric Thread (Male)	⅜"	¾"	1"	1¼"	1½"	2"
Inside Diameter	⅜"	¾"	1"	1¼"	1½"	2"
Electric Thread (Male)		⅜"	¾"	1"	1¼"	
Inside Diameter Flexible Conduit		⅜"	⅜"	¾"	1"	



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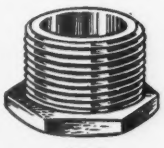
Special Features: Integral Earthing Terminal, tinned ready for soldering. Fixing screw for continuity. Internal threads suit all makes of flexible tubing.



MALE
Hex. Section

CONDUIT BUSHES

Made in the following sizes:

MALE: Electric Thread
⅜" ¾" 1" 1¼" 1½" 2"

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FEMALE
Flat Face Section for Spanner (except ¾" size, which is round)

CONDUIT HOOK

For fluorescent lamps and overhead lighting fittings. Screwed ¾" thread, male electric.

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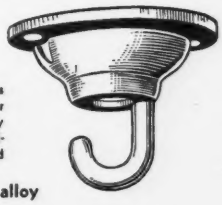
Both made in aluminium alloy

CEILING PLATE

One hook



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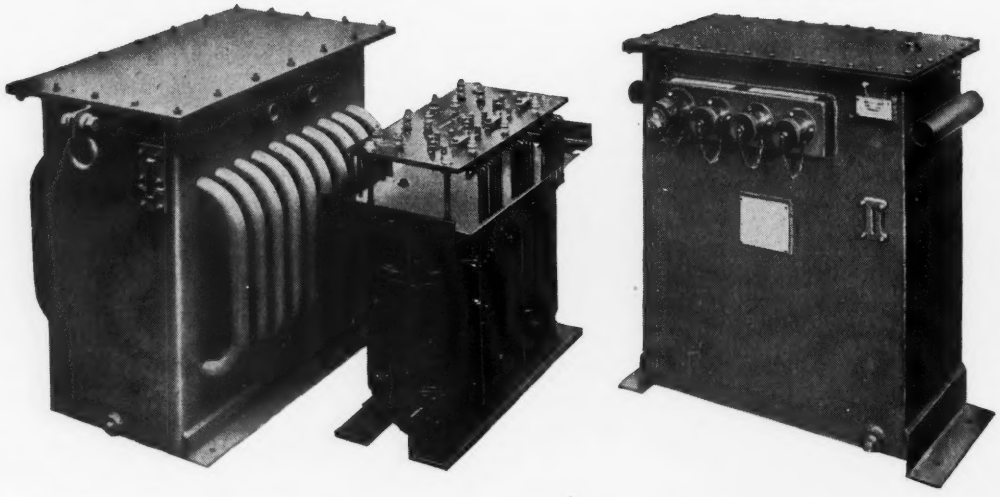

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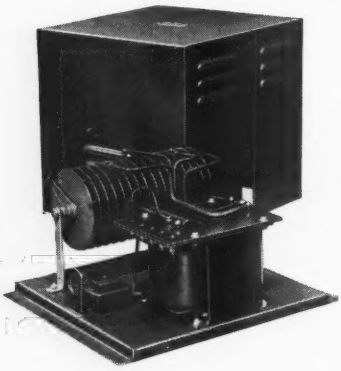

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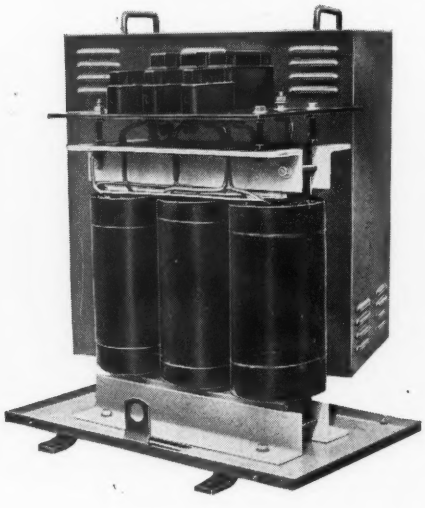

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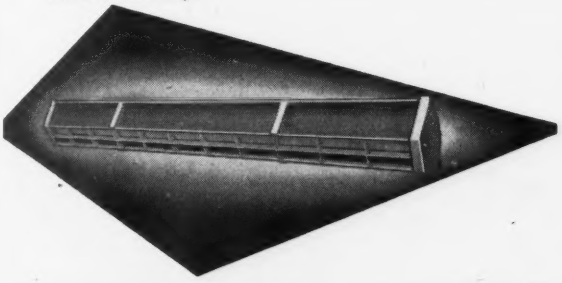

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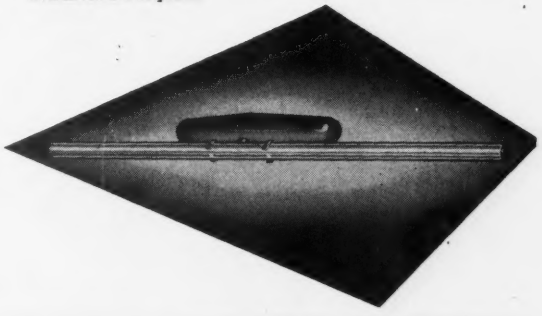

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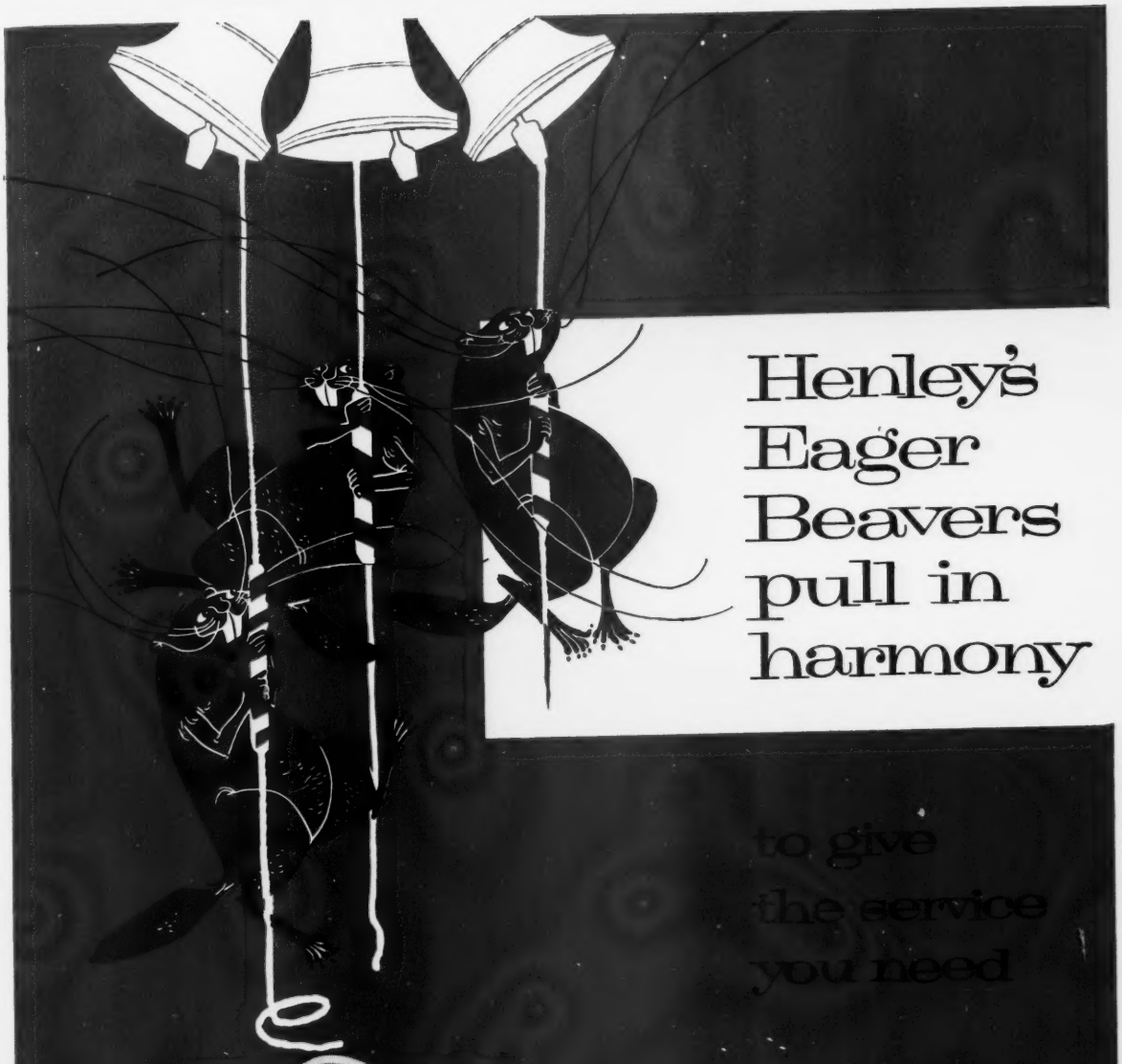

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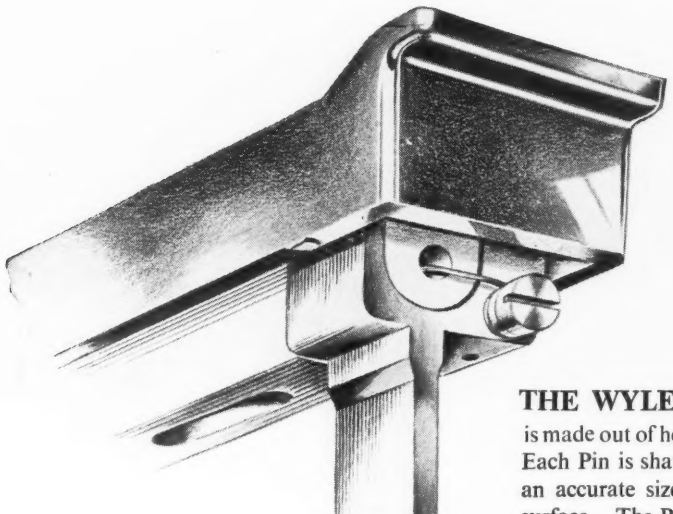

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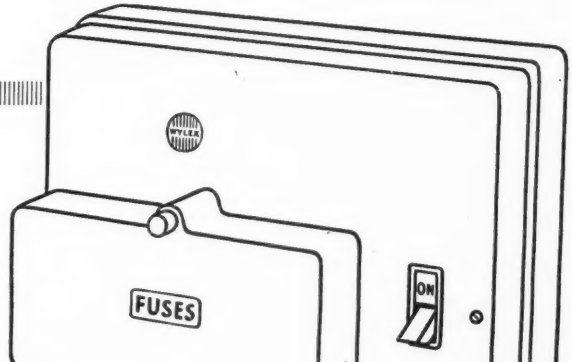

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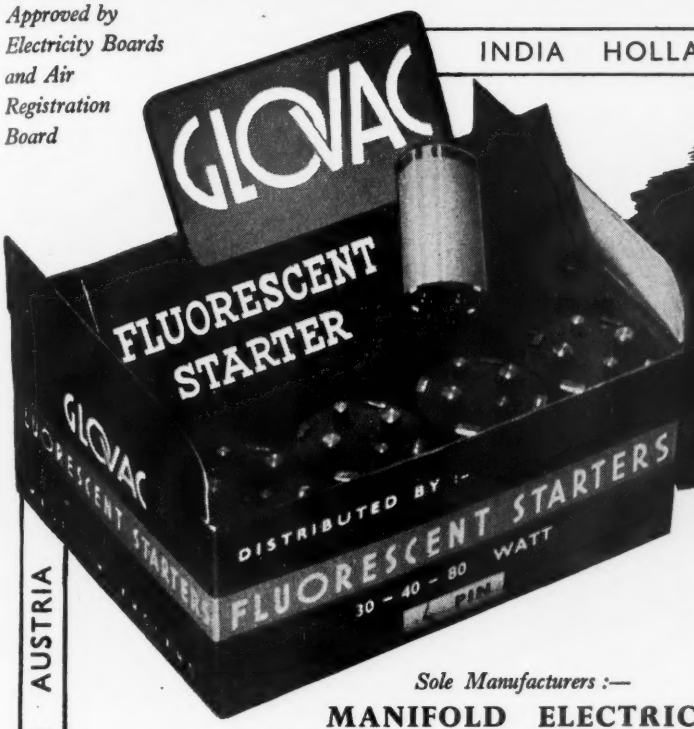

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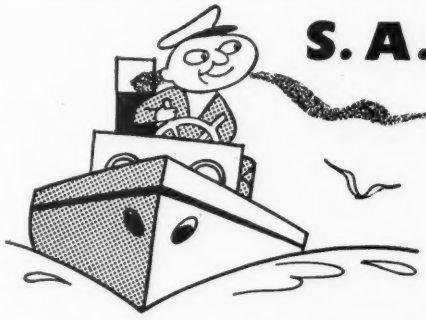

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The steam or dry iron that fills from the tap. Staybrite Stainless steel inside and out. It heats fast and stays hot—offers your customers easier quicker ironing and pressing than ever before.

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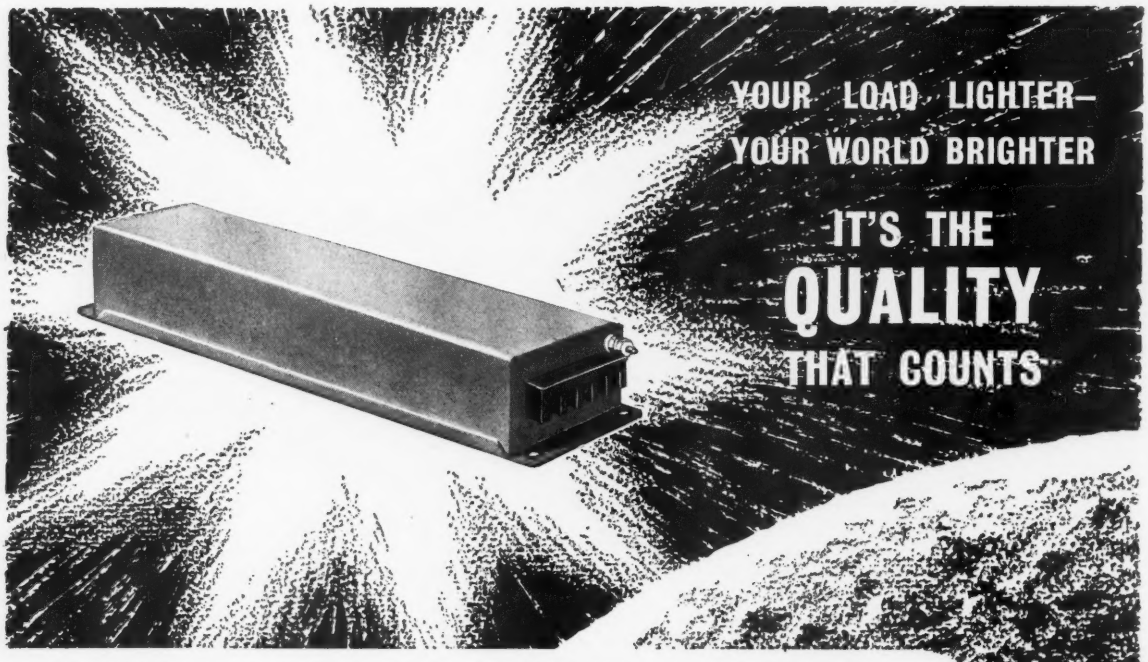

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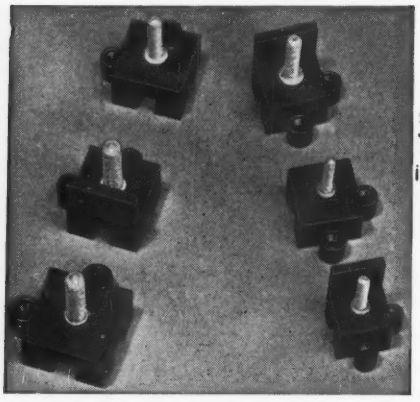

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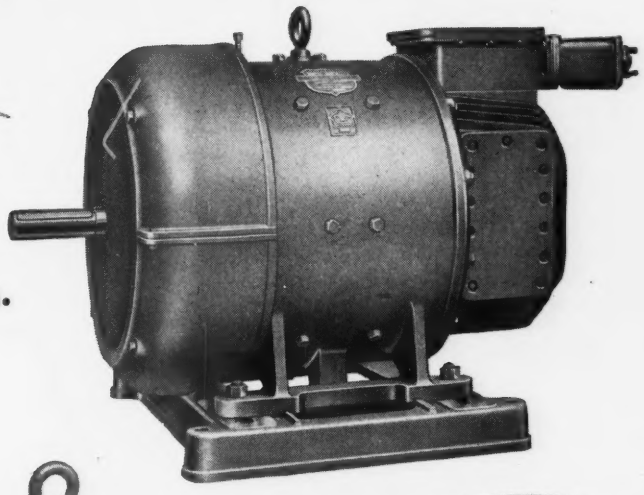

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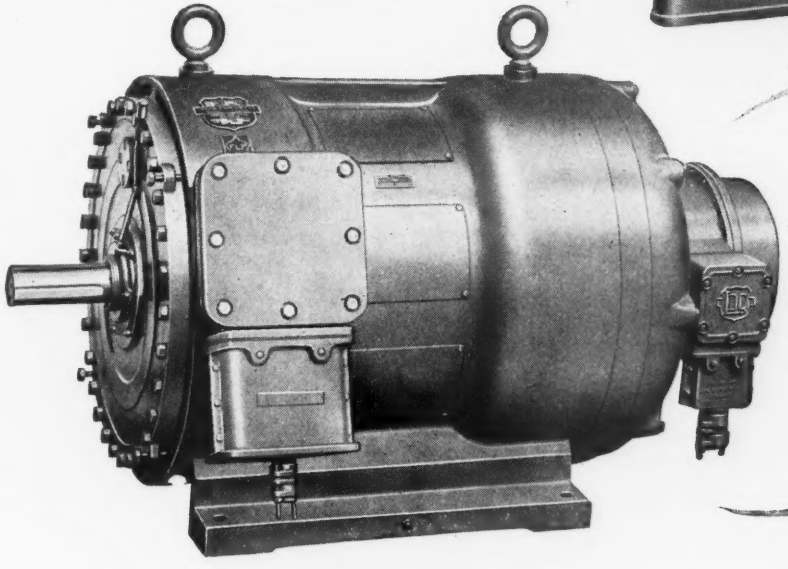

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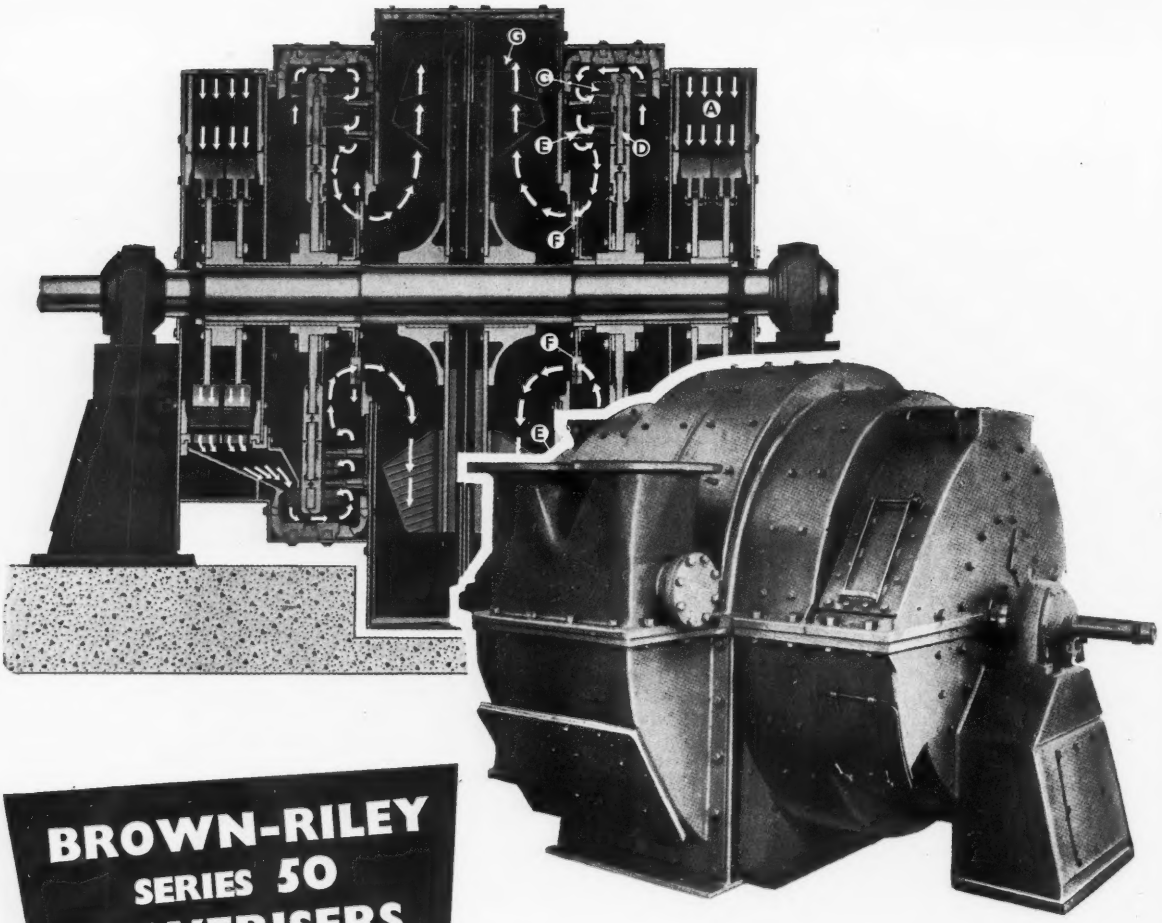

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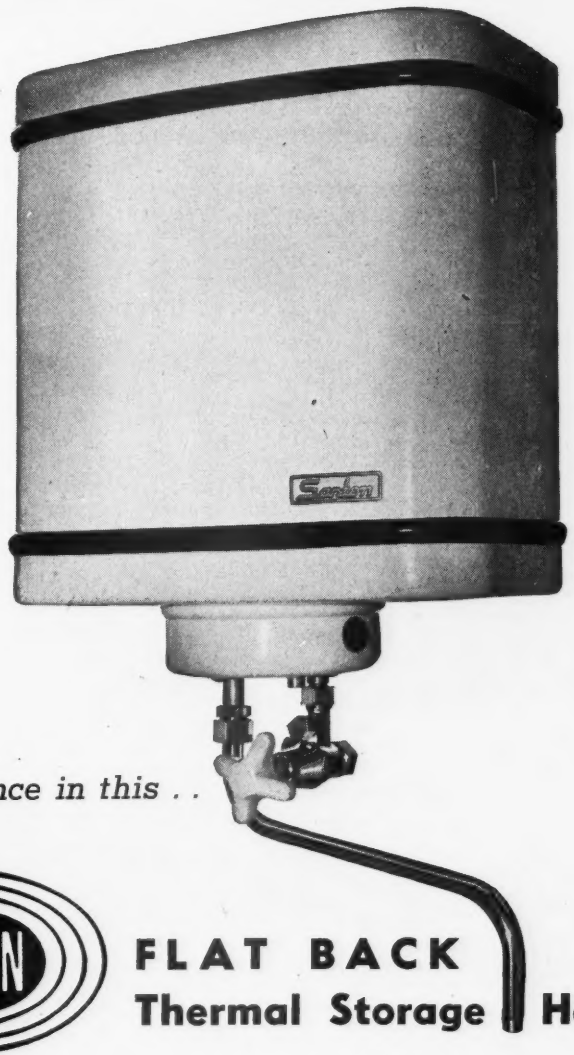

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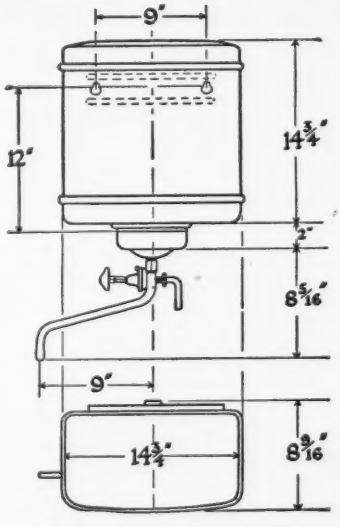

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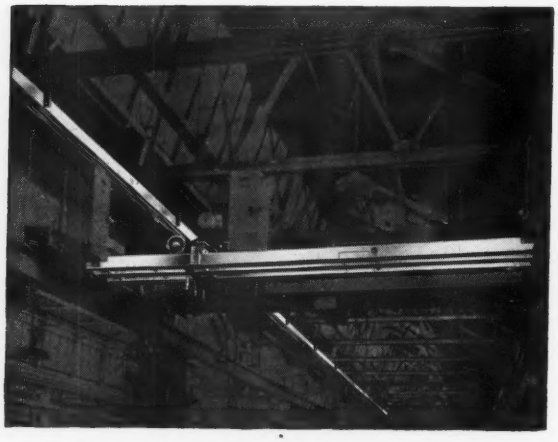

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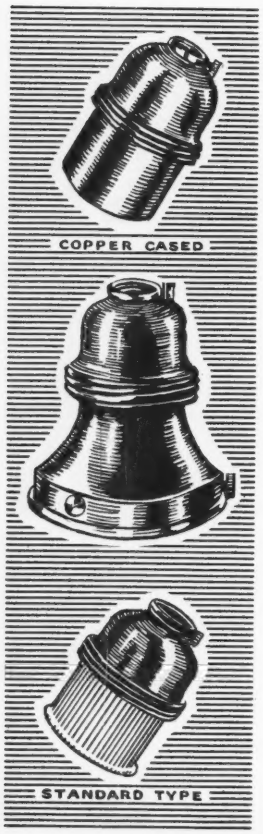

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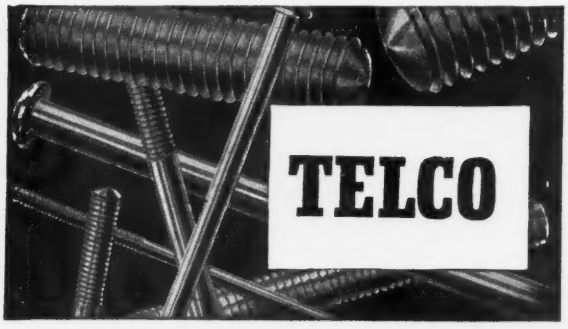

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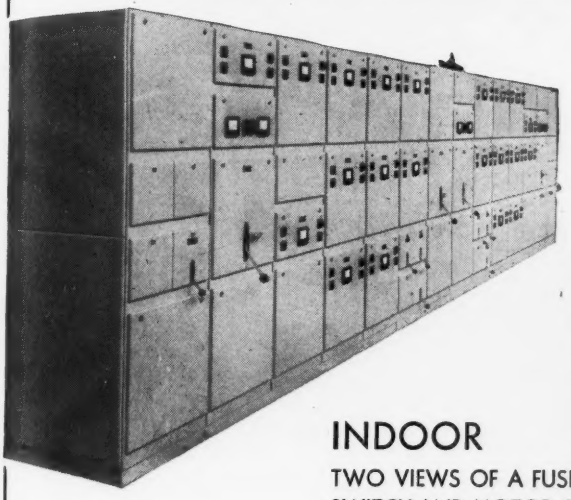

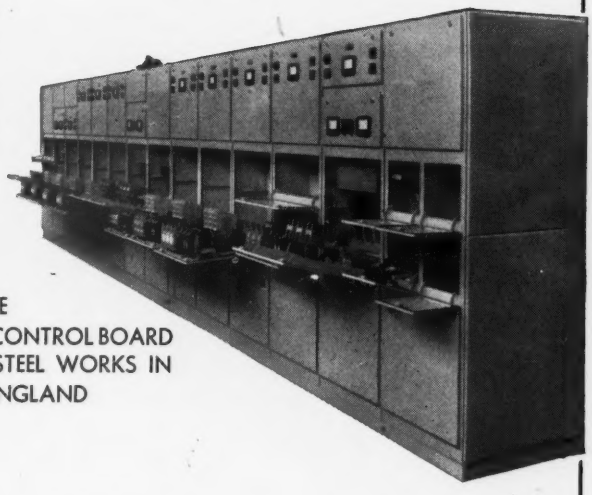

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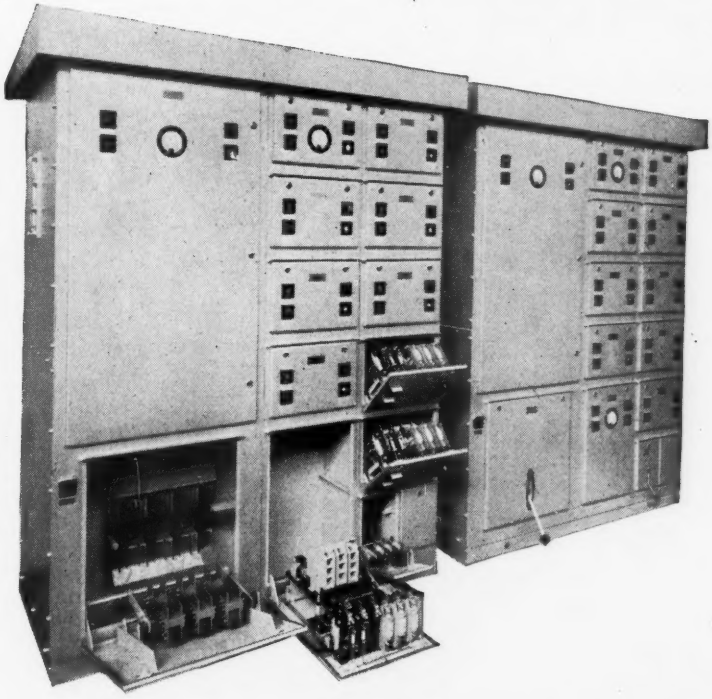
TWO VIEWS OF A FUSE SWITCH AND MOTOR CONTROL BOARD FOR AN IMPORTANT STEEL WORKS IN THE NORTH EAST OF ENGLAND



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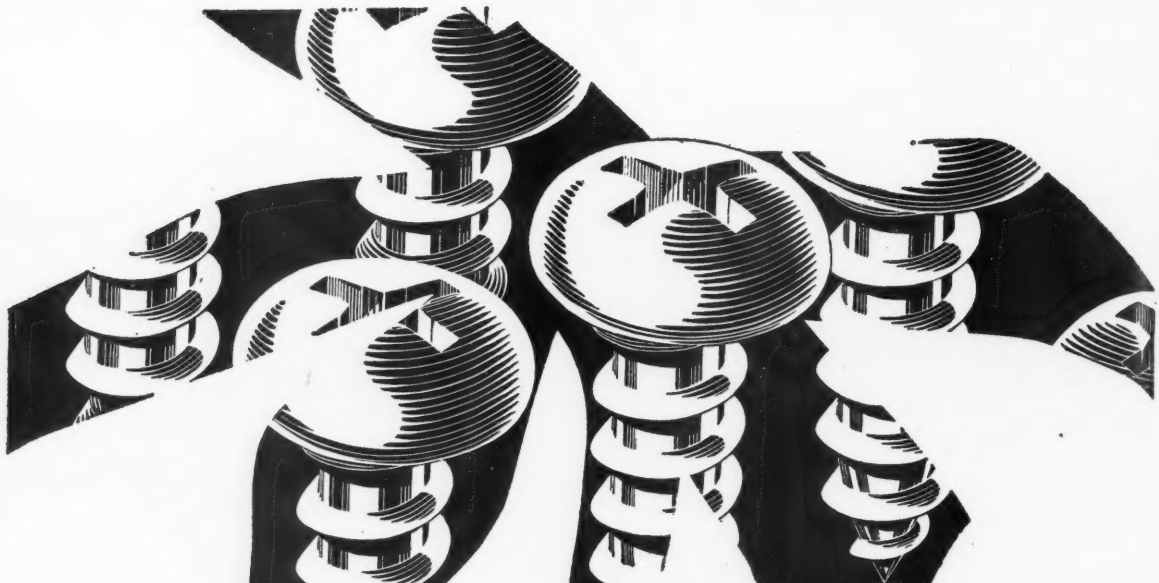

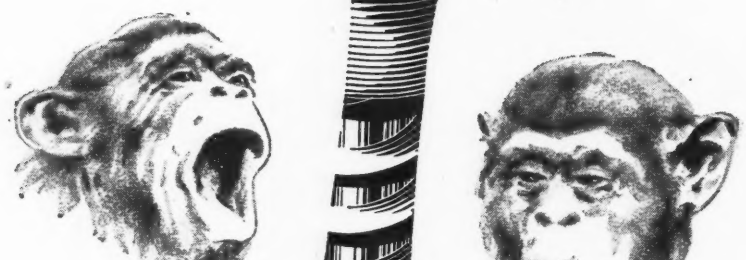

what, no nuts? . . .

Nuts to use nuts? Well, not exactly, but the fact that the Tapping Screw obviates the use of nuts is just one of its distinct advantages over the conventional Machine Screw. There's the saving in time to consider too. And cost. And there's no doubt whatever that the tapping screw makes for a better job all round. With its self-locating point the tapping screw forms its own thread thereby eliminating a separate and expensive tapping operation. Obviously it makes for easier assembly, is stronger, cheaper and faster. Safer too when the Phillips recessed head is specified, designed for power driving without damage to worker or job. You'll be well advised to change over to Tapping Screws. Nothing nuts about that !

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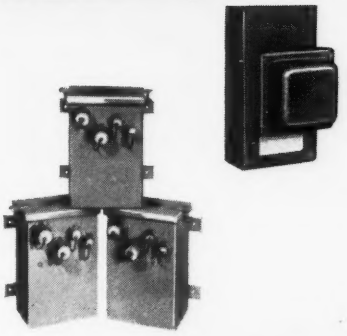

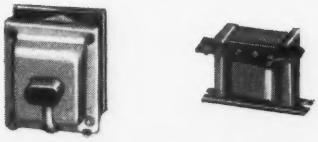

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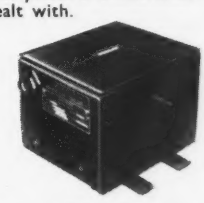

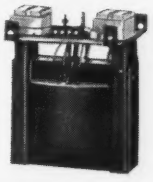

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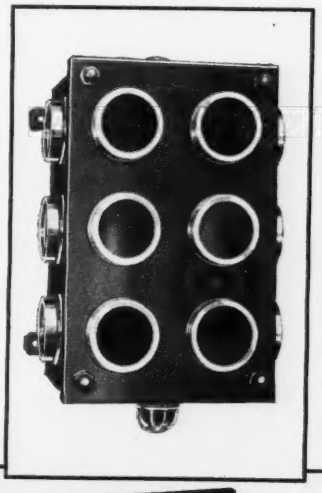

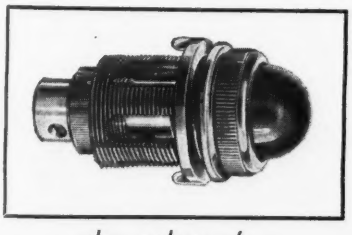

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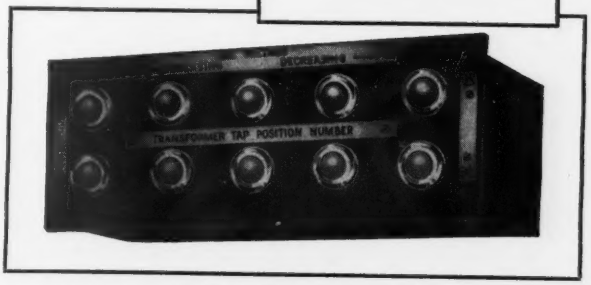

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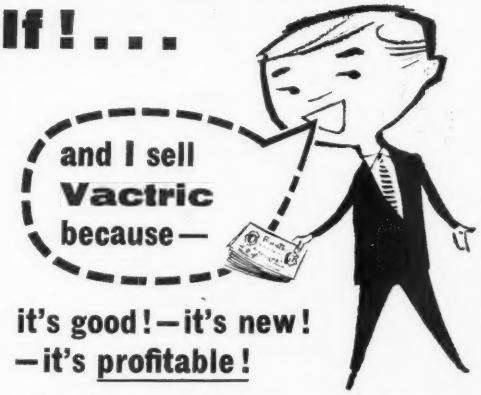

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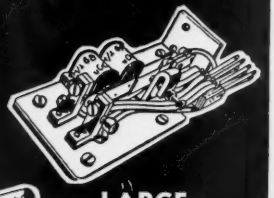

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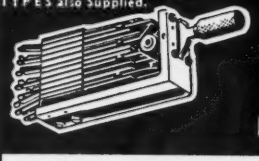

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throwing light on the subject —of easy to maintain lighting equipment

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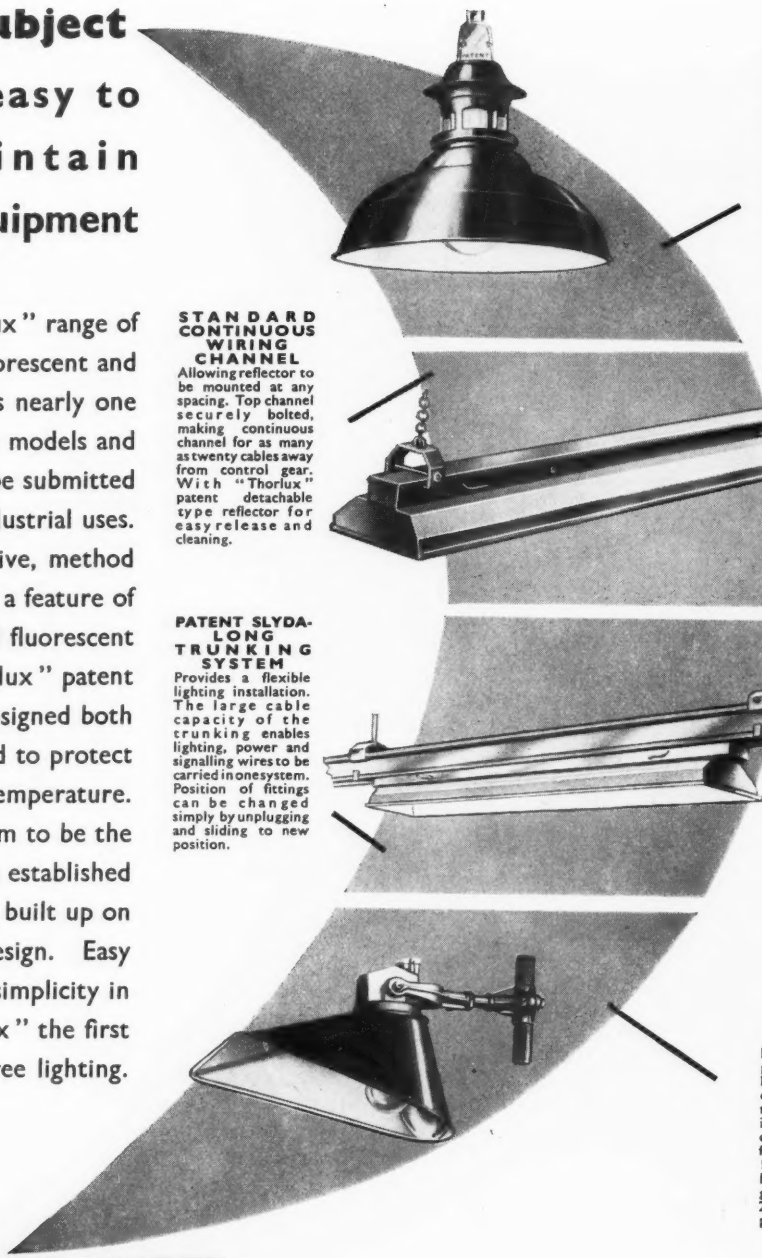

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Allowing reflector to be mounted at any spacing. Top channel securely bolted, making continuous channel for as many as twenty cables away from control gear. With "Thorlux" patent detachable type reflector for easy release and cleaning.

PATENT SLYDA-LONG TRUNKING SYSTEM
Provides a flexible lighting installation. The large cable capacity of the trunking enables lighting, power and signalling wires to be carried in one system. Position of fittings can be changed simply by unplugging and sliding to new position.

ADJUSTA-FLOODS
Ideal for garages, car parks and flood-lighting. The lamp can be adjusted to the vertical position irrespective of angle of reflector. With focussing for 300 to 1500 watt lamps. Reflector vitreous green and white. 27" × 24" weather proof.

THORLUX
REGD
THROWS LIGHT ON INDUSTRY

INDUSTRIAL LIGHTING EQUIPMENT

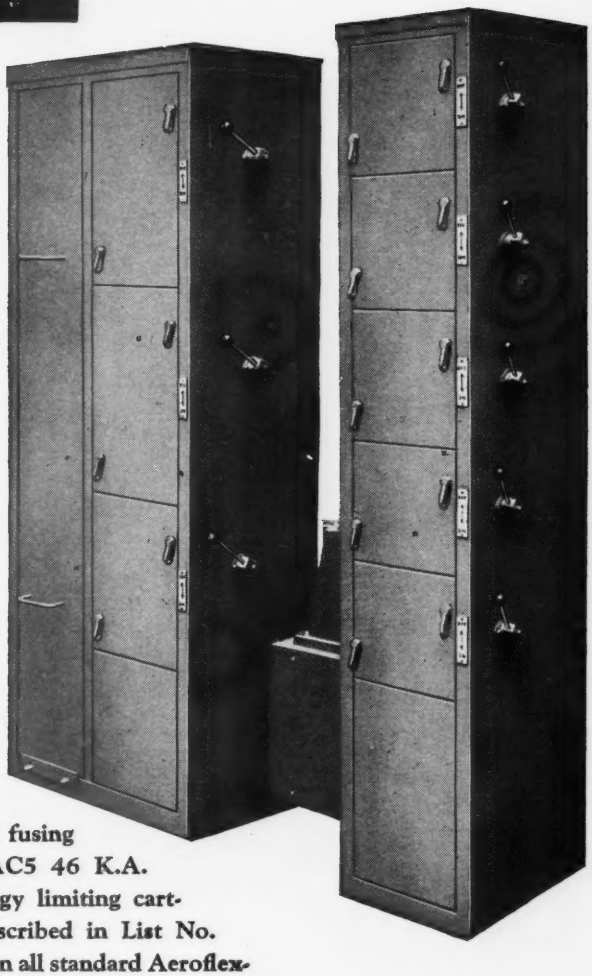
IMPORTANT *We are proud of our share in developing the "Overlamp" type of reflector. Our patented detachable trough is also rapidly becoming as popular in industry. Comprehensive Catalogue ER 1057 covering complete range sent on request.*

F. W. THORPE LTD. WELBY RD., HALL GREEN, BIRMINGHAM 28. *Springfield 3318-19-10. Grams: THORLUX, B'ham*

AEROFLEX
Fluvent

EFFICIENT DISTRIBUTION

Based on EFFICIENT PROTECTION



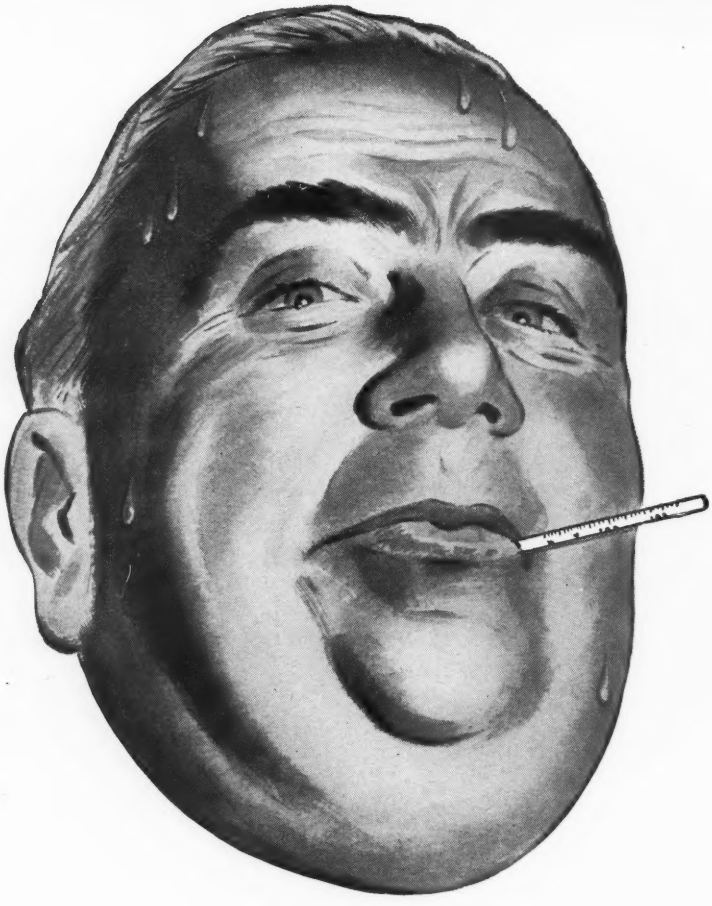
Aeroflex Class P 1.25 fusing factor, category 440 AC5 46 K.A. breaking capacity energy limiting cartridge fuse links, as described in List No. CF2, are now supplied in all standard Aeroflex-Fluvent gear, including *Fluvent Power Pillars* which are fully described in List No. PP1

Parmiter Hope & Sugden Ltd

FLUVENT ELECTRICAL WORKS · MANCHESTER 12

LONDON: 34 Victoria Street, S.W.1. *GLASGOW: 5 Somerset Place, C.3.* *BIRMINGHAM: Carrs Lane 4.*

dmPH110



"Are you running a temperature... that's too high for your pocket?"

How much does your boiler house cost to maintain? Quite a considerable amount, no doubt—and this is where the G.E.C. can help you. They are experts in industrial water heating equipment, and you can save yourself this cost by installing a G.E.C. Storage Water Heater. The thermostatic control on the heater ensures that the water is kept at the required temperature; furthermore you will have no fuel storage problems, no fumes and dirt and no maintenance expenses. *For further information write for publication H.4.*

G.E.C. Electric storage water heaters

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

G22

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

DEPARTMENT OF GOVERNMENT ELECTRICAL UNDERTAKINGS, CEYLON

Norton Hydro Power Station: Stage IIB, 50,000 kW

THE GOVERNMENT OF CEYLON will call for tenders shortly for the above work in four separate contracts, namely :—

Section A. The Civil Engineering work includes the construction of a concrete-lined tunnel approximately 20,000 ft. long, terminating in a surge chamber some 60 ft. in diameter and some 180 feet deep. Machines foundations tailraces and the superstructure of a power house, etc.

Section B. The provision of twin pipelines each some 3,100 ft. long with a diameter varying from 78″ to 63″, complete with valves.

Section C. The mechanical and electrical plant comprising two 25,000-kW vertical spindle alternators driven by water wheels, generating 11-kV, 3-phase, 50-cycle power ;

Seven 132/11-kV, 10-MVA, single-phase transformer units ;

One 132/11-kV, 30-MVA, three-phase transformer unit.

Four 132/11-kV, 10-MVA, three-phase transformer units, etc.

Section D. A double-circuit 132-kV transmission line approximately 4 miles ; a 132-kV double-circuit transmission line approximately 70 miles, and 132-kV double-circuit transmission line approximately 2 miles.

The Government anticipates that tenders will be invited in the first quarter of 1958, and it may be possible to place orders early in 1959. Tenderers should note that commissioning should take place not later than the end of 1961.

A memorandum setting out further details of the work will be issued to prospective tenderers on application to the undersigned on or before 27th November, 1957.

E. C. FERNANDO,
General Manager,
Department of Government
Electrical Undertakings.

Colombo, Ceylon.
6th November, 1957. 1164

URBAN DISTRICT COUNCIL OF COULSDON & PURLEY

New Sodium Lighting, Trunk Road A.23

TENDERS invited for provision and erection of 223 Tubular Steel Lighting Columns and provision and fixing of 140-watt Sodium Lamps and Lanterns on above road, approximately five miles long, and removal of existing street lighting equipment.

Specification, bills of quantities and forms of tender, prepared by H. M. Collins, Engineer and Surveyor, may be obtained from him upon receipt of a deposit of £4 4s., which will be refunded upon receipt of a bona fide tender and the return of documents supplied.

Plans and conditions of contract may be inspected at office of Engineer and Surveyor.

Sealed tenders in envelope provided to be submitted by not later than first post on 25th November, 1957.

The Council do not bind themselves to accept the lowest or any tender.

ERIC F. J. FELIX,
Clerk of the Council.

Council Offices,
Purley, Surrey. 1163

DEPARTMENT OF GOVERNMENT ELECTRICAL UNDERTAKINGS, CEYLON

Grandpass Steam Station: Stage IIB, 25,000-kW Initial Installation

THE GOVERNMENT OF CEYLON will call for tenders shortly for the above work in four separate contracts, namely :—

Section SA: All civil engineering works such as foundations, buildings access roads, cooling water culverts, etc.

Section SB: One 250,000 lb. per hour, 925 lb. per sq. inch pressure, 915 degrees Fahrenheit steam generating unit and auxiliary equipment.

Section SC: One 25,000-kW steam turbo-alternator unit for 900 lb. per sq. inch pressure and 900 degrees Fahrenheit, with regenerative feed heating and auxiliary equipment. Generating at 11 kV, 3-phase, 50 cycles.

Section SD: Single bay 132-kV outdoor double busbar switchgear installation. One 132/11-kV, 32-MVA, 3-phase, 50-cycle outdoor type step-up transformer unit, auxiliary equipment, etc.

The Government anticipates that tenders will be invited in the first quarter of 1958 and it may be possible to place orders early in 1959. Tenderers should note that commissioning should take place not later than the end of 1961.

A memorandum setting out further details of the work will be issued to prospective tenderers on application to the undersigned on or before 27th November, 1957.

E. C. FERNANDO,
General Manager,
Department of Government
Electrical Undertakings.

Colombo, Ceylon.
6th November, 1957. 1143

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Breadalbane Project

Main and Auxiliary Cabling Installation for Lochay Power Station

TENDERS are invited for the supply and the installation of the main and auxiliary cabling installation for Lochay Power Station, Perthshire.

Tender documents may be obtained from the Engineers, Messrs. Merz & McLellan, 72a, George Street, Edinburgh, 2, on receipt of £2 2s. deposit (returnable).

The Board do not bind themselves to accept the lowest or any tender. 1162

INDIA STORE DEPARTMENT

THE Director-General, India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, invites tenders for the supply of :—

Ref. No. 18030/AKR/HAL.
(a) D.C. Welding Generators, 275-amp. capacity.
(b) D.C. Welding Generator, 325-amp. capacity.

The tender forms, with schedules and specifications, which are returnable by Thursday, 12th December, 1957, may be obtained from the above office (C.D.N. Branch) on payment of a fee (which is not refundable) of ten shillings.

Applications for tender forms should clearly state the reference number. 1142

ESHER URBAN DISTRICT COUNCIL

Installation of Public Street Lighting, Hurst Road, Riverbank (B.370), East and West Molesey: Contract No. 249

THE Council are prepared to receive tenders for the provision and erection of 74 Concrete Columns, 19 ft. mounting height, provision and fixing of enclosed lanterns for 80-watt Sodium Vapour Lamps, together with lamps, control gear and ancillary works.

Form of tender, conditions of tender, specification and bills of quantities may be obtained from the Engineer and Surveyor, Council Offices, Esher, on payment of a deposit of one guinea, which will be refunded on the receipt of a bona fide tender, together with the return of all documents. Drawings and conditions of contract may be inspected at the office of the Engineer and Surveyor during normal working hours.

Tenders, on the prescribed form, enclosed in the envelope provided, endorsed "Contract No. 249," and bearing no name or mark indicating the sender, must be addressed to the undersigned, and received by him not later than 5 p.m. on Tuesday, 26th November, 1957.

The Council do not bind themselves to accept the lowest or any tender.

FREDERICK EDWARDS,
Clerk of the Council.

Council Offices,
Esher, Surrey.
31st October, 1957. 1181

EPSOM AND EWELL CORPORATION

Water Department

Tenders for the Supply of Pumping Plant

THE Council invite tenders for the supply and installation of three electrically operated Pumps, complete with motors and switchgear, each capable of a duty of 350 gallons per minute against a head of 160 feet.

Copies of the specification may be obtained on application to Mr. L. D. Evans, B.Sc.(Lond.), A.M.Inst.C.E., A.M.Inst.W.E., Borough Water Engineer and Manager, Waterworks, East Street, Epsom.

Sealed tenders must be forwarded as directed so as to reach me not later than 7th December, 1957.

The Council does not bind itself to accept the lowest or any tender.

EDWARD MOORE,
Town Clerk.

Town Hall,
The Parade, Epsom. 1180

WORTLEY RURAL DISTRICT COUNCIL

Street Lighting, Leeds-Exeter Trunk Road, A.61

TENDERS are invited for the supply and installation of 35 Group "A" Street Lamps at Tankersley, near Barnsley, comprising enclosed 140-watt Sodium Lanterns on 25-ft. Concrete Columns.

Plans and documents may be obtained from Mr. Arthur Wikeley, M.I.Mun.E., Engineer and Surveyor, Council Offices, Grenoside, near Sheffield, on payment of £3 3s. deposit, returnable on receipt of a bona fide tender.

Tenders enclosed in the envelope provided must be received by the undersigned not later than 2.30 p.m. on Friday, 6th December, 1957.

The Council do not bind themselves to accept the lowest or any tender.

ADRIAN M. KELLY,
Clerk to the Council.

1116

Official Notices (continued)

BOROUGH OF COLWYN BAY

Trunk Road A.55 : Lighting

Section 4, Dingle Bridge to Brompton Avenue

TENDERS are invited for the following works required in the lighting of approximately 1¼ miles of Trunk Road in the Borough:

1. The provision and erection of 60 Class A Lighting Columns.
2. The provision and fixing of Lanterns, Control Gear and other equipment.

Separate tenders will be considered for Items 1 and 2 or for the whole of the works. The Council wishes to consider tenders for both steel and concrete columns, and alternative bills of quantities are therefore included in the tender documents.

Plans may be inspected and copies of the tender documents obtained upon application to Mr. H. Wilman, A.M.I.C.E., Borough Engineer and Surveyor, Whalley Range, Lansdowne Rd., Colwyn Bay.

Tenders in plain sealed envelopes, endorsed "Trunk Road Lighting, Section 4," must be delivered to the undersigned not later than 12 noon on Saturday, 30th November, 1957.

The Council do not bind themselves to accept the lowest or any tender.

HAROLD E. BRAITHWAITE,
Town Clerk.

Town Hall,
Colwyn Bay.
29th October, 1957. 1125

COUNTY BOROUGH OF BLACKPOOL

Supply of Electric Lamps, 1958/1959

TENDERS are invited for the supply and delivery of the Corporation's Electric Lamp requirements for the year ending 31st March, 1959.

Specifications, forms of tender and conditions of tender may be obtained on application to the Illuminations and Public Street Lighting Officer, Rigby Road East, Blackpool.

Completed tender forms must be submitted, sealed in the addressed envelopes provided, to reach me not later than 10 a.m. on Wednesday, 18th December, 1957.

ERNEST C. LEE,
Town Clerk.

P.O. Box 11,
Town Hall, Blackpool. 1117

URBAN DISTRICT COUNCIL OF BASILDON

Public Lighting

TENDERS are invited for the supply, delivery and erection of Sixty-seven Sodium Discharge Lamps on concrete columns in High Road, Langdon Hills; London Road, Pitsea; and London Road, Wickford.

Tenders must be returned to the undersigned by 20th November, 1957.

A. HATT,
Clerk of the Council.

98, High Street,
Billericay, Essex.
October, 1957. 1126

PATCHWAY PARISH COUNCIL

TENDERS are invited for the supply and erection of 64 140-watt Sodium Discharge Lamps mounted on 25-ft. columns on trunk road A.38 in the parish of Patchway, Glos.

Tender documents may be obtained from the undersigned. Tenders, in plain sealed envelopes endorsed "Tender," must be delivered to the undersigned not later than 2nd December, 1957.

The Council do not bind themselves to accept the lowest or any tender.

V. C. HALLETT, D.P.A.,
Clerk of the Council.

23, Mervyn Road,
Bishopston, Bristol, 7. 1179

SITUATIONS VACANT

BRITISH KLOCKNER SWITCHGEAR LIMITED

Chertsey, Surrey

TECHNICAL SALES ENGINEERS required for London and Home Counties. Knowledge of motor control gear; sales experience preferred but not essential. Apply giving full particulars to—Managing Director. 166

CENTRAL ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following vacancies in this Division :—

SECOND ASSISTANT ENGINEER (Civil),
GENERATION (Construction) DEPT.,
SPONDON POWER STATION
(Vacancy No. 188/57/ER).

Preference will be given to applicants who have a degree in civil engineering, are Corporate Members of the Institution of Civil Engineers, or possess equivalent qualifications.

Candidates should have had experience in the design and construction of heavy foundations, river works, structures in reinforced concrete and steel, and other civil engineering and building works associated with the design and construction of power stations.

Experience in the preparation of specifications, bills of quantities and estimates will be a recommendation.

Salary will be in accordance with Class AX/EX, Grade 2 (£1,145-£1,410 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 20th November, 1957.

SHIFT CONTROL ENGINEER,
AVON POWER STATION, WARWICK
(Vacancy No. 190/57/ER).

Candidates should be suitably qualified and have had experience in the control room.

Salary will be in accordance with Class E, Grade 10 (£685-£730 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 20th November, 1957.

SHIFT CHARGE ENGINEER,
DERBY POWER STATION
(Vacancy No. 192/57/ER).

Applicants should have had a sound technical training and considerable experience in a modern power station. Preference will be given to candidates who are Graduate Members of the Institution of Electrical or Mechanical Engineers, or who hold similar qualifications. A knowledge of pulverised fuel firing will be an advantage.

Salary will be within Class F, Grade 7 (£885-£930 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 20th November, 1957.

ASSISTANT ENGINEER
(Electrical R. & M.),
COVENTRY POWER STATION
(Vacancy No. 195/57/ER).

Applications from suitably qualified engineers are invited. Applicants should have served an apprenticeship and had good experience in maintenance of all electrical machines and equipment in a modern power station.

Salary in accordance with Class G, Grade 8 of the National Joint Board Agreement (£885-£930 per annum).

Closing date for receipt of applications, 27th November, 1957.

SHIFT CHARGE ENGINEER,
DRAKELOW POWER STATION
(Vacancy No. 196/57/ER).

Candidates should be suitably qualified and have had experience with large-capacity high-pressure turbo-alternators and pulverised fuel fired boilers.

Applicants should be in possession of technical qualifications admitting to Corporate Membership of the Institution of Electrical Engineers and/or the Institution of Mechanical Engineers.

Salary will be in accordance with Class J, Grade 7 (£1,065-£1,140 per annum) of the National Joint Board Agreement plus 10% shift enhancement.

Closing date for receipt of applications, 27th November, 1957.

FIRST ASSISTANT CHEMIST,
NORTHAMPTON POWER STATION
(Vacancy No. 198/57/ER).

Previous experience in a power station laboratory is desirable and candidates should hold the Higher National Certificate in Chemistry.

Candidates must be familiar with the methods of sampling and analysis of coal, water and oil, and with the interpretation of the analytical results.

Conditions of service and salary will be in accordance with Class G, Grade 9 (£835-£880 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 27th November, 1957.

SHIFT CHARGE ENGINEER,
BURTON-ON-TRENT
POWER STATION
(Vacancy No. 199/57/ER).

Sound technical training and practical experience in the control and operation of steam generating plant and main switchgear are required. Appropriate qualifications an advantage.

Salary in accordance with Class E, Grade 7 (£835-£880 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 27th November, 1957.

These appointments will be pensionable within the provisions of the Central Electricity Authority and Area Boards (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. PLEASE QUOTE VACANCY NUMBER.

L. F. JEFFREY,
Divisional Controller.

30th October, 1957. 1169

CENTRAL ELECTRICITY AUTHORITY

South Eastern Division

THIRD ASSISTANT ENGINEERS (Transmission) required in the Croydon and Brighton Districts.

Applicants should preferably possess H.N.C. in Electrical Engineering or equivalent qualification, and have experience in the operation and maintenance of overhead lines, transformers and switchgear up to 275 kV. Experience in control of labour is essential. Applicants should indicate whether they are interested in one or both appointments.

Salary Class AX/DX, Grade 5, £1,055-£1,285 per annum plus London allowance for Croydon appointment.

FOURTH ASSISTANT ENGINEER in the new Transmission District based at Canterbury.

The successful candidate will be required to work on all matters dealing with the operation and maintenance of the transmission grid system. Some construction work may be also involved. He should preferably have had experience in the maintenance of steel tower overhead lines, E.H.T. switchgear and transformers. Possession of H.N.C. an advantage.

Salary Class AX/DX, Grade 8, £710-£910 per annum.

Applications in respect of all the above positions giving details of education, age, present position, experience, etc., should be sent to the Establishments Officer, Central Electricity House, Lower Ham Road, Kingston-on-Thames, Surrey, so as to arrive by 16th November, 1957, quoting reference 205. 1187

SOUTH OF SCOTLAND ELECTRICITY BOARD

Clyde Area

Second Assistant Engineer

APPLICATIONS are invited for the post of SECOND ASSISTANT ENGINEER in the Commercial Department of Clyde Area Headquarters. Applicants should have had a sound engineering training to at least Higher National Certificate standard or equivalent, and should preferably have experience in utilisation of electrical energy by all classes of consumers; a knowledge of installation work, space and water heating and tariffs would be an advantage.

The salary and conditions of service for this post will be in accordance with the N.J.B. Agreement, the present grading being Class K, Grade 7, £1,160/£1,235 per annum. The position will be superannuable.

Forms of application, obtainable from me, should be returned to me not later than two weeks after the appearance of this advertisement.

DANIEL ROSS,
Manager.

P.O. Box 15,
206, St. Vincent Street,
Glasgow, C.2.
29th October, 1957. 1167

CITY OF SALISBURY, SOUTHERN RHODESIA

Electricity Department

Vacancy for Technical Assistant, Grade 1

APPLICATIONS are invited for the fixed establishment post of TECHNICAL ASSISTANT GRADE 1 in the Street Lighting Section of the City of Salisbury Electricity Department on the salary scale £1,225 × £50 to £1,525 per annum. Commencing salary is at the minimum of the grade and no cost-of-living or other allowances are payable.

Candidates must have a sound technical training and practical experience in electrical engineering, with at least 8 years' experience in street lighting, preferably with a municipal undertaking. They must be conversant with street lighting codes of practice and will be responsible for carrying out design and installation work on street lighting schemes and for organising the maintenance programme on all street lighting equipment. They must be neat draughtsmen and capable of preparing all types of working drawings and plans required in the above-mentioned work. Higher National Certificate, Graduate Membership of the Institution of Electrical Engineers, or Associated Membership of the Institution of Public Lighting Engineers would be an advantage.

The appointment will be subject to the Council's service and leave regulations, and the successful applicant will be required to furnish a satisfactory medical certificate of fitness. He must also be able to comply with the requirements of the immigration authorities.

Candidates are requested to submit full particulars of their qualifications, training and experience, which should include details of positions held and salaries received. Age, place of birth, nationality, and marital state should also be given, and copies of not more than three recent testimonials may be included.

Further particulars regarding conditions of service, leave entitlement, allowances towards travelling and removal expenses are obtainable from Davis & Soper Ltd., 52 & 54, St. Mary Axe, London, E.C.3, to whom applications must be submitted on or before 29th November, 1957. 1130

YORKSHIRE ELECTRICITY BOARD

No. 2 (Huddersfield) Sub-Area

THIRD ASSISTANT ENGINEER (System Design).

Applicants should be Graduate Members of the Institution of Electrical Engineers or hold equivalent qualifications and have had experience in planning extensions of distribution systems operating at 11 kV and below, together with the preparation of the relevant technical reports and estimates. They should also have had practical experience in the construction, operation and maintenance of H.V. and M.V. distribution systems. This appointment offers an opportunity for a wide and varied experience to be obtained in a Sub-Area System Design Section.

Salary N.J.B. Class K, Grade 9 £995/£20/£1,055 per annum.

Applications giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market Street, Huddersfield, not later than 22nd November, 1957.

No. 3 (Sheffield) Sub-Area

SHEFFIELD DISTRICT (North). FOURTH ASSISTANT DISTRICT ENGINEER.

Applicants should be technically qualified up to Higher National Certificate level, and should have experience of distribution engineering on systems up to 11 kV.

Salary N.J.B. Class K, Grade 11, £885/£15/£930 per annum.

Applications giving details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 22nd November, 1957.

No. 5 (Wakefield) Sub-Area

BARNSLEY DISTRICT. THIRD ASSISTANT DISTRICT ENGINEER.

Applicants should have a sound practical training and experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Candidates should preferably have attained the technical standard of the Higher National Certificate in Electrical Engineering, or equivalent qualifications.

Candidates must be prepared to reside in the district and undertake standby duties.

Salary N.J.B. Class G, Grade 9, £835/£15/£880 per annum.

Applications giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 22nd November, 1957.

No. 1 (Bradford) Sub-Area

OTLEY DISTRICT. THIRD ASSISTANT DISTRICT ENGINEER.

Applicants should have passed the Associate Membership Examination of the Institution of Electrical Engineers, or hold equivalent qualifications, and have experience in construction, operation and maintenance of high voltage systems, underground cables and overhead lines and substations, and medium low voltage networks.

Candidates should be prepared to reside within the District and undertake standby duties.

Salary N.J.B. Class F, Grade 9, £790/£15/£835 per annum.

Applications giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45/53, Sunbridge Road, Bradford, not later than 22nd November, 1957.

No. 4 (Leeds) Sub-Area

DEMONSTRATOR (Female).

Candidates must have had a two-year full-time course in domestic subjects at a recognised training college and preferably possess the E.A.W. Certificate.

Previous experience of demonstrating will be an advantage.

Salary N.J.C. Grade 1, £500/£20/£600 per annum.

WETHERBY DISTRICT. FIRST ASSISTANT DISTRICT ENGINEER.

Applicants should have had experience in the design, construction, operation and maintenance of overhead and underground distribution networks in mixed urban and rural areas.

The successful applicant will be required to deputise for the district engineer in his absence and will be personally responsible under the district engineer for all distribution design work and for the overall supervision of sub-station construction work.

Preference will be given to applicants who are Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications.

Salary N.J.B. Class F, Grade 5, £995/£20/£1,055 per annum.

Applications giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, nr. Leeds, not later than 22nd November, 1957. 1193

WILTSHIRE EDUCATION COMMITTEE

N.W. Wilts College of Further Education, Engineering Department, Cocklebury Road, Chippenham

REQUIRED in January, or as soon as possible thereafter, two ASSISTANT TEACHERS, GRADE B, to teach mathematics and mechanical engineering subjects.

Salary scale £625 × £50 to £1,025, with allowances for graduation and training.

Commencing salary will depend upon previous experience. For further particulars and application forms, apply to the Principal. 1197

VERITYS LIMITED

Plume Works, Aston, Birmingham, 6

SWITCHGEAR DESIGNER wanted. Sound technical knowledge and experience of development work is desirable.

Assistance in the obtaining of a house will be given if required, and moving expenses paid. Superannuation scheme available.

Reply in first instance by letter giving full details of qualifications and experience to Head of Research and Development. 124

CENTRAL ELECTRICITY AUTHORITY

Research Laboratories, Leatherhead, Surrey

APPLICATIONS are invited for the following vacancies :—

ASSISTANT ENGINEERS to work on a wide range of problems associated with conventional and nuclear power stations. Present investigations concern heat transfer in nuclear fuel elements and heat exchangers, electrostatic precipitators, cooling towers and boiler feed pumps.

Candidates for Second and Third Assistant Engineer vacancies should have an honours degree with previous research experience; for other vacancies a pass degree or H.N.C. with appropriate experience would be acceptable, but importance is attached to ability to apply fundamental knowledge to a wide range of problems.

Salaries according to ability :—

Second Assistant,	£1,160 - £1,510 p.a.
Third Assistant,	£1,055 - £1,265 p.a.
Fourth Assistant,	£820 - £995 p.a.
General Assistant,	£550 - £725 p.a.

PROTECTIVE GEAR ENGINEERS to work on a variety of problems arising from the use of protective systems, relays and similar devices and involving development of new techniques and liaison with users of protective relays in Electricity Boards and Divisions. Fault throwing and other field tests on the system are carried out, and the successful candidate will be required to take responsibility for some aspects of this work, including oscillography.

Candidates should preferably have a degree or equivalent qualification and ability to apply a fundamental knowledge to the study of electrical and electro-mechanical problems in relays and protective gear circuits.

Salaries £1,055-£1,265 p.a., £820-£995 p.a. and £550-£725 p.a. according to ability.

FOURTH ASSISTANT ENGINEER to assist in experimental testing and development work in the laboratory and in the field on radio and television interference from high-voltage transmission lines involving field strength and voltage measurements at radio frequencies, calibration of equipment and analysis of experimental data.

Candidates should have a degree or equivalent qualification and ability to apply fundamental knowledge to a variety of problems.

Salary £820-£995 p.a. according to ability.

GENERAL ASSISTANT ENGINEER to undertake investigations into a variety of mechanical and electrical engineering problems associated with transmission and distribution of electricity, including the static dynamic and thermal properties of overhead line conductors and fittings. The work will be mainly in the laboratories, but occasionally opportunities for investigations on site will arise.

Candidates should have H.N.C. in Mechanical or Electrical Engineering, and preferably some practical experience.

Salary £550-£725 p.a. according to ability.

Application forms from D. Moffat, Director of Establishments, Central Electricity Authority, Winsley Street, London, W.1, to be returned by 30th November. Quote ref. E.R./472. 1148

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the post of FOURTH ASSISTANT ENGINEER (Civil) in the Generation/Construction Section of the Chief Engineer's Department.

Applicants should have a sound civil engineering training to at least Higher National Certificate standard or equivalent. Previous experience in the design or construction of civil engineering works connected with generating station projects would be an advantage.

Salary N.J.B. Schedule B, Class AX/DX, Grade 8, £710/£910 per annum. The position is superannuable.

Applications should be submitted on the standard form, which may be obtained from the undersigned, and should reach this office not later than 21st November, 1957. Please quote reference E.51/57.

ANDREW A. WALLACE,
Secretary.

P.O. Box 173,
351, Sauchiehall Street,
Glasgow, C.2. 1146

Situations Vacant *(continued)*

CENTRAL ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following appointments at LITTLE BARFORD GENERATING STATION :—

ASSISTANT MAINTENANCE ENGINEER (Electrical) (S.V. No. 978).

Salary Class G, Grade 9, £835 × £15 to £880 per annum, eventually rising to Class J, Grade 9, £935 × £20 to £995 per annum.

Applicants should have served an apprenticeship, possess suitable technical qualifications, and have had experience in the maintenance of the electrical plant in a modern generating station.

Housing accommodation may be available.

Applicants who applied as a result of the advertisement which appeared on the 20th September will be reconsidered without making further application.

GENERAL ASSISTANT ENGINEERS (S.V. No. 979).

Salary Class G, within the range of Grades 15/13, £540 × £15 to £680 per annum plus 10% shift allowance, eventually rising to Class J, Grades 15/13, £635 × £15 to £785 per annum plus 10% shift allowance.

The commencing salary will depend upon the duties and responsibilities.

Duties of the above posts include assisting in the electrical control room and experience in the technical operation of electrical, boiler house and turbine house plant, testing, etc., in a generating station, and provide a suitable basis for promotion to higher technical grades.

Manual workers in skilled grades with suitable technical training will be considered. Previous experience in a generating station and/or technical training to the standard of Ordinary National Certificate or its equivalent will be of advantage.

Apply by 16th November, 1957, quoting the appropriate S.V. number, stating age, qualifications, experience and present position, to the Controller, Central Electricity Authority, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts.

W. N. C. CLINCH,
Controller. 1149

INSULATION ENGINEER

AN appointment is to be made to the technical staff of our Tamworth factory to investigate problems associated with the design of insulators. Applicants must have had sound basic knowledge of electrical engineering, particularly dielectrics. Some experience in industry is desirable and qualifications up to the level of Graduate I.E.E. essential.

We are looking for a young man of initiative and ambition who will eventually fill a senior appointment which may involve foreign travel. A knowledge of foreign languages is desirable.

Apply to:—
Technical Director,
DOULTON INDUSTRIAL PORCELAINS LTD.
Doulton House, Albert Embankment, London, S.E.1.

1200

DIESEL ENGINEER

(Temporary)

required for one or two tours of duty by iron ore mining company in WEST AFRICA for overhaul of engines of diesel electric locomotives. Knowledge of maintenance of units up to 1,200 h.p. essential.

Salary £1,050 plus guaranteed bonus of 5% plus for married man separation allowance of £10 per month and £5 per month for each child. Return passage paid. Initial kit allowance. Free furnished quarters.

Write giving full details experience, stating age, married or single, to SIERRA LEONE DEVELOPMENT CO. LTD., Dept. D7, City-Gate House, Finsbury Square, London, E.C.2.

1132

COUNTY BOROUGH OF BLACKPOOL

Illuminations and Street Lighting Department

APPLICATIONS are invited for the superannuable post of CHIEF TECHNICAL ASSISTANT, A.P.T. IV (£1,025 × £50 to £1,175 p.a.).

Applicants should preferably be Corporate Members of the Institution of Electrical Engineers, but experienced Graduates will be considered. They should have a sound knowledge of lighting techniques, be capable administrators, and should preferably have a knowledge of Local Government procedure.

Intending candidates should apply to the Illuminations and Public Street Lighting Officer, Rigby Road East, Blackpool, for further particulars, application forms and special conditions of service to which the post is subject. Completed applications must be received by him not later than 10 a.m. Friday, 22nd November, 1957.

ERNEST C. LEE,
Town Clerk. 1118

PRODUCTION ENGINEERS

APPLICATIONS are invited from Engineers to serve in a pre-shop and manufacturing production control team at

ENGLISH ELECTRIC
NETHERTON

on the northern outskirts of Liverpool.

The works are largely engaged on heavy engineering, particularly hydro-electric projects, and have extensive fabrication and machining facilities.

Duties would involve the control and co-ordination of large component manufacture on a one-off basis, covering shop loading, progressing and despatching.

Membership of the Institution of Mechanical, Electrical or Production Engineers would be an advantage, but skilled men with experience in heavy plant manufacture and who have a flair for production engineering are invited to apply.

The company provides excellent working conditions and first-class welfare and sports facilities, pension schemes, etc.

Full details of age, experience and present salary should be sent to :—

Dept. C.P.S.

336/7, Strand, London, W.C.2

Quote Ref. ER.3094A.

1120

NORTH WESTERN ELECTRICITY BOARD

SENIOR SALES REPRESENTATIVE (Male), BOLTON DISTRICT.

Duties include advising consumers, on their premises, on all matters normally concerned with sales development, i.e., tariff queries, and apparatus sales for domestic and small commercial and industrial applications.

Experience in the application of electricity to agriculture and horticulture would be an advantage.

Applicants should possess the E.D.A. Sales Certificate, and preference will be given to those who have taken courses of study in electrical engineering.

Salary scale £615 × £20 to £675 p.a., Grade 2. N.J.C. conditions.

Applications, naming three referees, to Sub-Area Manager, No. 2 Sub-Area, North Western Electricity Board, 2, St. George's Road, Bolton, by 16th November, 1957.

FOURTH ASSISTANT DISTRICT ENGINEER, RIBBLESDALE DISTRICT.

The duties will include assistance in the operation, maintenance and construction of substations and H.V. and L.V. underground and overhead mains, fault location, and the general maintenance of supply in the District.

Preference will be given to applicants who hold the H.N.C. in Electrical Engineering.

Salary scale £635 × £15 to £680 p.a., Grade E.11. N.J.B. conditions.

ENGINEERING DRAUGHTSMAN, SUB-AREA ENGINEER'S DEPARTMENT, BLACKBURN.

Applicants should have had a good technical training with drawing office experience. The duties of the post will include the layout and detailing of indoor and outdoor substations up to and including 33,000 volts, together with diagrams of connections of the associated switchgear, transformer and protective systems.

Salary scale £595 × £20 to £715 p.a., Schedule D, Grade 6. N.J.B. conditions.

Applications for the above posts, naming three referees, to Sub-Area Manager, No. 5 Sub-Area, North Western Electricity Board, Jubilee Street, Blackburn, by 16th November, 1957. 1150

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Fens Sub-Area

137/57.R.

SERVICE CENTRE ASSISTANT (Male or Female), St. Neots.

Applications are invited for the position of service centre assistant at St. Neots. Salary N.J.C. General Clerical Grade. Male: £200-£565. Female: £185-£520.

Apply by letter, within seven days, to the Secretarial Officer, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambs.

Northmet Sub-Area

SUB-AREA HEADQUARTERS, LONDON, N.14

138/57.R.

ENGINEERING DRAUGHTSMAN (Ref. 759).

Candidates should have had training and experience in overhead line design, layout of associated equipment, survey and route plans, and underground and overhead mains records.

Salary N.J.B. Schedule D, Grade 6 (£595-£715) plus London allowance.

Apply by letter to C. C. Hill, B.Sc.(Eng.), M.I.E.E., M.I.Mech.E., Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14, by 18th November, 1957.

STEVENAGE DISTRICT

137/57.R.

THIRD ASSISTANT ENGINEER (Ref. 706).

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary N.J.B. Class F, Grade 9 (£790-£835).

Apply by letter to H. L. Sumner, Manager, Eastern Electricity Board, Walkern Road, Stevenage, Herts, by 18th November, 1957.

1186

SOUTH EASTERN ELECTRICITY BOARD

SENIOR SHOWROOM ASSISTANT, Surrey.

Salary £615-£675 per annum plus London weighting under N.J.C. Grade 2. Superannuable.

Applicants must have knowledge of electrical appliances and should be experienced in general showroom and cashier duties, and have the ability and initiative to promote sales. Possession of the E.D.A. Diploma an advantage. The successful applicant will be in charge of a mobile showroom operating in the Surrey Sub-Area, from Kingston and District office at 22, Claremont Road, Surbiton.

Applications, giving names of two referees, on forms obtainable from C. W. Hughes, B.Sc., M.I.E.E., Surrey Manager, SEEBOARD, Rough Rew, Ridgeway Road, Dorking, Surrey, must be returned to him by 20th November, 1957.

SENIOR SALES REPRESENTATIVE, Dorking and Epsom District.

Salary £615 × £20 to £675 per annum under N.J.C. Grade 2. Superannuable.

The person appointed will be required to give advice on supply matters, tariffs and appliance sales and installations for domestic and small commercial consumers. Applicants must be thoroughly conversant with all types of domestic electrical appliances, and in addition to acting as an outside representative must be prepared to carry out general showroom duties in any showroom within the Dorking and Epsom District.

Applications, naming two referees, on forms from C. L. B. White, District Manager, SEEBOARD, 56, South Street, Dorking, by 20th November, 1957.

GENERAL ASSISTANT ENGINEER, Sevenoaks and Reigate District.

Commencing salary £685 to £790 p.a. under N.J.B. Agreement, Class F, Grades 11 to 9, according to qualifications, experience and ability. Superannuable.

Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems, preferably up to 33 kV. The position entails standby duties. The successful applicant will operate from District Office, Oxted, and his duties will cover any point within the District's area.

Applications, naming two referees, to H. F. Gill, District Manager, SEEBOARD, Electric House, West Hill, Oxted, by 20th November, 1957.

A. L. BURNELL,
Secretary. 1195

SALES ENGINEER
(Electrical)

THE Metal Rectifier Division of this company invites applications for the above senior position.

This is an internal post and responsibilities will include the administration of the selenium rectifier stack and silicon device sales section, technical quotations, customer correspondence, and liaison.

H.N.C. (Electrical) or equivalent and experience in a similar capacity preferred.

The commencing salary will be competitive, and prospects are good.

HOUSING ACCOMMODATION IS AVAILABLE IN THE NEW TOWN IF REQUIRED.

Informal discussions can be arranged in London or Harlow.

Please write, giving all relevant particulars, and quoting Ref. No. D.26, to :—

Personnel Manager
STANDARD TELEPHONES AND CABLES LIMITED
Rectifier Division
Edinburgh Way, Harlow, Essex

1182

ELECTRICAL DRAUGHTSMEN

required for UGANDA GOVERNMENT PUBLIC WORKS DEPARTMENT on agreement for one tour of 30 to 36 months in first instance.

Initial salary according to age and experience in scale (including inducement pay) £813 rising to £1,341 a year. Provident fund. Outfit allowance £30. Free passages. Liberal leave on full salary.

Candidates, preferably aged 30 to 40, must have at least five years' experience as electrical draughtsmen with large contracting or manufacturing organisation, and be capable of preparing detailed drawings of electrical circuit diagrams and wiring installations under the direct supervision of an electrical engineer. Knowledge of electrical terminology and familiarity with symbols used on electrical drawings essential.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/42109/EF. 1144

BAGHDAD ELECTRICITY SERVICES

Vacancy for

Power Station Chemist

A STATION CHEMIST is required for duty at the Sarrafyah Steam Station, 53½ MW capacity, in Baghdad at a salary of ID.1,680 per annum plus C.O.L. allowance of ID.16 to ID.25 a month according to number in family. The Iraqi Dinar is equivalent to the Pound Sterling.

Applications are invited from suitably qualified persons with previous experience of water treatment plant and fuel analysis.

Appointment is on contract for three years with three months' leave on full pay and allowances after twenty-four months' service in Baghdad.

There is a provident fund to which the Services contribute 10% and the employee 5% of basic salary.

First class air passages are provided for successful applicant, his wife, and children under the age of 16 years.

A house, with heavy furniture, including a refrigerator and air-cooler, is provided free.

Application should be made to

SOFINA

38, rue de Naples

Brussels, Belgium

giving details of education, training and previous experience, and enclosing a recent photograph.

1114

SOUTHERN ELECTRICITY BOARD

Agricultural Representative

Basingstoke District of No. 3 (Portsmouth) Sub-Area. Salary N.J.C. Grade 3 (£680-£740 per annum). N.J.C. conditions of service.

Candidates should possess a General Certificate of Education or its equivalent, and have a sound knowledge of the applications of electricity in agriculture and horticulture, be capable of preparing estimates for small wiring installations and equipment; conducting negotiations and obtaining new business. Ability to give talks to agricultural organisations will be an advantage.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed, not later than 18th November, 1957.

Engineering Draughtsman

No. 2 (Newbury) Sub-Area Office, Substation Section. Salary N.J.B. Schedule D, Grade 6 (£595 × £20 to £715 per annum), point of commencement dependent upon qualifications and experience. N.J.B. conditions of service.

Applicants should be qualified draughtsmen and the successful applicant will be required to undertake, under supervision, the preparation and final layout of diagrams and drawings relating to substation plant and equipment. Possession of suitable technical qualifications will be an advantage.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him in envelopes suitably endorsed, not later than 18th November, 1957.

The successful candidates for the above appointments will be required to contribute to the C.E.A. and Area Boards (Staff) Superannuation Scheme, if eligible. 1192

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments :—

Area Board Headquarters, Chief Commercial Officer's Department

PRINCIPAL ASSISTANT (Publicity), Carliol House, Newcastle.

Applicants should have a good working knowledge of all advertising media, including press, direct mail and cinema screen advertising, and be able to design and produce first-class window displays, exhibition stands, sales promotional literature, posters, etc. Experience in modern design, decoration and layout of showrooms an advantage. Commencing salary according to qualifications within Grade 9, £1,285/£1,405 and conditions of service in accordance with N.J.C. Agreement.

Wear Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER, Durham District.

Applicants must be qualified electrical engineers with sound practical training and experience in construction, operation and maintenance of overhead and underground networks and associated plant and equipment. Salary Schedule A, Class F, Grade 9, £790/£835. N.J.B. conditions of service.

Applications stating age, qualifications and experience to be received by the Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box 117, Carliol House, Newcastle upon Tyne, 1, within ten days of the appearance of this advertisement. 1194

CENTRAL ELECTRICITY AUTHORITY

Yorkshire Division

APPLICATIONS are invited for an appointment of SECOND ASSISTANT STATION CHEMIST at Ferrybridge A and B Power Stations, near Knottingley.

Salary £935-£995 per annum, Class L, Grade 11, National Joint Board Agreement (Schedule A).

Applicants should hold the Higher National Certificate in Chemistry and preferably have had previous power station experience. A good general analytical experience is required, preferably associated with the chemical control of water, coal and oil supplies.

Application forms obtainable from the Divisional Secretary (Establishments), Central Electricity House, St. Mary's Road, Leeds, 7, to be returned within 14 days of the appearance of this advertisement. 1209

Situations Vacant (continued)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

Central Gloucestershire Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER
(Dean Forest).

Applicants should have had a sound technical training and experience in the construction, operation and maintenance of overhead and underground distribution systems. Technical qualifications desirable. Salary £740/£785 per annum (N.J.B. Grade E.9).

Apply by letter, within fourteen days, stating age, experience, present salary and position to Mr. S. Raybould, Sub-Area Manager, Midlands Electricity Board, 126, London Road, Gloucester.

Worcester and District Sub-Area

FITTER (Electrical)
(Redditch).

Experience in installation and maintenance of H.V. and L.V. switchgear, transformers, etc., essential. Wages at present 4s. 7½d. per hour. N.J.I.C. conditions.

JOINTER (E.H.T.)
(Redditch).

Present rate of pay 4s. 7½d. per hour. N.J.I.C. conditions.

Apply by letter to District Manager, Midlands Electricity Board, Smallwood Street, Redditch.

A. STEPHENS,
Secretary.
1183

CENTRAL ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following positions:—

GENERAL ASSISTANT ENGINEERS
(S/13.963).

Applicants should have served an apprenticeship or had practical training suitable to the industry. They should possess a sound general and technical education and preference will be given to those possessing a Higher National Certificate (or those nearing completion of H.N.C. courses). Opportunities are available for general assistant engineers to complete their studies and gain wide experience with good prospects of promotion.

The duties of those appointed will vary, but will include as a general rule, the operation and control, under supervision, of generating plant. There are a number of these vacancies at generating stations in this Division.

Vacancies also exist for those who wish to specialise in maintenance of electrical and mechanical generating plant, transmission lines, substations and cable, or generating station construction work.

Salary N.J.B. within scale £540-£730.

Special application forms for the above vacancies obtainable only from P. D. A. Oliver, Divisional Secretary, 111, High Street, Portsmouth, should be returned by 20th November, 1957. 1188

BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION

THE E.D.A. TESTING HOUSE is a national institution responsible for testing for safety and performance all types of domestic appliances, agricultural and light industrial equipment on behalf of Electricity Boards and the British Standards Institution. This interesting work is carried on in modern laboratories situated in Leatherhead, Surrey. Canteen facilities are available and the Association is operating a pension scheme. Applications are invited for vacancies in the following grades:—

TEST ENGINEERS. Applicants should have previous experience in an electrical testing laboratory; a knowledge of the design of domestic electrical appliances advantageous. Higher National Certificate in Electrical Engineering or Physics, or similar qualifications. Salary within the range £810 to £935 per annum.

ASSISTANT TEST ENGINEER. Applicants should have an interest in electrical testing and have attained as a minimum qualification National Certificate in Electrical Engineering or Physics. Salary within the range £550 to £625 per annum.

Apply in writing to the Director, British Electrical Development Association, 2, Savoy Hill, London, W.C.2. 1127

CENTRAL ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following posts at Divisional Headquarters, Cockfosters, adjacent to Cockfosters Station (Piccadilly Line):—

SENIOR DRAUGHTSMEN
(Electrical).

Salary Schedule D, Grade 4, £945-£1,045 per annum (including London weighting). The commencing salary will depend upon experience and qualifications.

Applicants should preferably have experience in the layout of generating station auxiliaries, including H.V. switchgear, transformers, lighting and cabling.

New offices recently completed in pleasant surroundings, excellent working conditions. Canteen available. Sports and social club, sick pay and superannuation schemes. Generous holidays.

Applications, quoting reference No. 2/8574, stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Authority, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts, to arrive by 23rd November, 1957.

W. N. C. CLINCH,
Controller. 1168

ELECTRICAL ENGINEER

Electricity Department, Sierra Leone

TO assist control and development of supply systems which may include erection of overhead lines up to 11,000 volts, substation erection and power station installations, testing protective gear and underground cable fault location.

Contract appointment for two tours of 18-24 months in first instance. Salary range £1,262-£2,063 per annum gross plus a gratuity of £37 10s. for each three months' satisfactory service. Free passages for officer and wife and up to two children, or maintenance allowance in lieu. Quarters, if available, at low rent. Generous leave.

Candidates, under 45 years of age, must have passed or be exempt from the examination for A.M.I.E.E., and have several years' subsequent practical experience in a position of responsibility.

Alternatively, ex-R.E. officers without the above professional qualifications, but having extensive practical experience in a senior position, will be considered.

Write Director of Recruitment, Colonial Office, Great Smith Street, London, S.W.1, giving age, qualifications and experience. Quote BCD.145/15/01. 1145

ELECTRICAL SUPERINTENDENT

required to take charge of electrical maintenance and installation work at an open-cast mining establishment in BRITISH WEST AFRICA. Possession of A.M.I.E.E. or H.N.C. qualifications an advantage. The equipment includes normal plant and workshop electrical equipment, power stations, 3,300-volt and L.T. distribution systems.

Commencing salary £2,000 plus 5% bonus plus, for married man, passage or separation allowance of £10 per month and £5 per month for each child. 15-month tours followed by liberal leave on full salary in U.K. Return passage paid. Free furnished quarters and medical attention. Contributory pension scheme with retirement at age 55. Life assurance and dependants' income schemes.

Write giving full details experience, stating age, married or single, to SIERRA LEONE DEVELOPMENT CO. LTD., Dept. ES6, City-Gate House, Finsbury Square, London, E.C.2. 1133

YOUNG ENGINEERS

interested in gaining experience of the erection of lattice tower, concrete and wood pole overhead transmission lines and willing to serve either at home or overseas. Technical background up to H.N.C. (Electrical) standard desirable, but previous experience of this kind of work not essential. Pension fund.

Write giving full particulars and quoting reference C/76/55 to Staff Officer, British Insulated Callender's Construction Company Limited, 30, Leicester Square, London, W.C.2 174

NOTTINGHAM AND DISTRICT TECHNICAL COLLEGE

Shakespeare Street, Nottingham
Principal: D. A. R. Clark, M.Sc.(Tech.), M.I.Mech.E.

APPLICATIONS are invited for the following posts:—

LECTURER IN ELECTRICAL ENGINEERING Special interest and industrial experience in electrical power engineering desirable.

ASSISTANT GRADE B IN ELECTRICAL ENGINEERING. Qualifications in power engineering are required.

Salaries in accordance with the Burnham Technical Scale as follows:—Lecturer: £1,200 rising by annual increments of £30 to £1,350 per annum. Assistant Grade B: £650 × £25 to £1,025 per annum. Additions for Assistants include degree allowance of £75 per annum (or £125 for good honours degree), up to 3 increments of £25 for training in approved cases and incremental allowance for industrial experience after age 21, and war service.

Further particulars and form of application may be obtained from the Principal. Completed forms should be returned not later than 22nd November, 1957. 1185

DESIGN ENGINEER

MOTOR CONTROL GEAR

ESTABLISHED manufacturing company requires engineer experienced in design of contactors and auxiliaries, capable of producing, if necessary from theoretical considerations, electrically and mechanically sound designs which accord with modern manufacturing techniques.

Wide knowledge of applications essential.

Senior position, carrying appropriate salary, etc.

Write, giving details of age, experience and qualifications, to—Box 1131.

CITY OF LEEDS EDUCATION COMMITTEE

Leeds College of Technology
Cookridge Street, Leeds, 2
(Principal: C. Chew, M.Sc.Tech., F.R.I.C.)

APPLICATIONS are invited for the post of SENIOR LECTURER in Electrical Engineering. Salary scale £1,350 × £50 to £1,550 a year. Applicants should possess suitable technical qualifications, together with appropriate teaching and industrial experience, and should be able to offer Telecommunications or Electronic Engineering.

Further particulars and form of application, to be returned by the 30th November next, may be obtained by sending a stamped addressed foolscap envelope to the Principal of the College.

GEORGE TAYLOR,
Chief Education Officer.

Education Department,
Leeds, 1. 1129

CHIEF ELECTRICAL DESIGNER

CROMPTON PARKINSON LTD., DONCASTER, YORKS., invite applications for the post of CHIEF ELECTRICAL DESIGNER for F.H.P. Motors.

The Company are looking for a man with imagination and initiative backed by a good engineering degree. The work will include the design and development of new ranges of A.C. and D.C. motors and practical motor design experience is essential.

The salary offered will be generous and in keeping with the post advertised and the qualifications and experience of the successful candidate.

Conditions of employment are excellent; the company operates a superannuation scheme, and financial assistance towards removal and housing will be considered in appropriate cases.

Write in confidence to the Personnel Officer, giving full details. 1199

CENTRAL ELECTRICITY AUTHORITY

London Division

APPLICATIONS invited for following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of I.E.E. or I.Mech.E. an advantage.

BOILER HOUSE
SHIFT CHARGE ENGINEER,
BARKING A/B POWER STATION
(Vacancy No. 57/991).

Applicants should have had a sound technical education and experience with modern boiler house operation, including pulverised fuel. Salary Class L, Grade 9 = £1,115 plus £106 10s. p.a. shift allowance.

Applications, quoting vacancy number, to (or on form from) Central Electricity Authority, London Division, P.O. Box 136, London, W.1, by 18th November, 1957. 1147

CENTRAL ELECTRICITY AUTHORITY

Southern Division

FOURTH ASSISTANT ENGINEER, SWINDON REGION, TECHNICAL DEPARTMENT (S/13.966).

Applicants should have experience of electrical engineering in relation to protective gear including testing, and knowledge of modern switchgear practice is desirable. Applicants should possess H.N.C. or equivalent, and preference will be given to those who hold or are studying for membership of a recognised professional institution.

Salary N.J.B. Class AX/CX, Grade 7, £810-£985 or Grade 8, £710-£885.

Special application forms obtainable only from P. D. A. Oliver, Divisional Secretary, Central Electricity House, High Street, Portsmouth, should be returned by 20th November, 1957. 1190

CENTRAL ELECTRICITY AUTHORITY

Southern Division

SENIOR DRAUGHTSMAN (Electrical) and ENGINEERING DRAUGHTSMAN (Electrical),
CONSTRUCTION DEPT.
(S/13.965).

Applicants should have had experience of the layout of switchgear, cables and lighting in connection with power station construction. Experience in schematic diagrams will be an advantage. Candidates should have had a good technical education in electrical engineering.

Salary :—
Senior Draughtsman, Grade D/5, £760-£860.
Draughtsman, Grade D/6, £595-£715.

Special application forms, obtainable only from P. D. A. Oliver, Divisional Secretary, Central Electricity House, High Street, Portsmouth, should be returned not later than 20th November, 1957. 1189

TRANSFORMERS AND POWER CAPACITORS

YOUNG ENGINEERS required for Sales and Contracts office. Applicants should be desirous of adopting a technical sales career and be prepared to extend their technical education to Higher National standard.

Apply—

Sales Manager
BRYCE ELECTRIC CONSTRUCTION CO. LTD.
Kelvin Works, Hackbridge, Surrey

1039

ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL

requires staff to run small electrical and mechanical workshops serving the Thermo-Nuclear Research Project.

Apprenticeship required ; also experience of w/s control and supervision, and either precision workshop fittings and machining or electrical power relay and control systems. O.N.C. an advantage.

Salary £700-£1,050 (Tech. II/III).

Housing, superannuation and excellent conditions.

Send POSTCARD for application form and details to Recruitment (912Y/48), A.E.R.E., Harwell, Didcot, Berks. 1119

SURREY EDUCATION COMMITTEE

Wimbledon Technical College, Gladstone Road, London, S.W.19

APPLICATIONS are invited for the post of SENIOR LECTURER in ELECTRICAL ENGINEERING, to commence duties on 1st January, or as soon as possible thereafter. Experience in teaching at H.N.C. level in any two of the following is required :—

Transmission and Distribution of Electrical Energy.
Advanced Electrotechnology.
Measurements.
Engineering Physics.

Salary £1,350 × £50 to £1,550 p.a.

Further details and application form obtainable from the Principal, to whom completed applications should be sent by 22nd November, 1957. 1184

TECHNICAL EDITORIAL ASSISTANT

ELECTRICAL REVIEW has a vacancy for a technical assistant, aged 25 to 30, at the London offices. Qualified engineer with a degree or at least Graduate Membership of the I.E.E. and some experience in the electrical manufacturing or supply industries.

Applicant must be prepared to travel and interest himself in the whole range of activities of the electrical industry. A broad outlook and facility of expression essential.

Write giving age, salary, qualifications and experience to the Managing Editor, Electrical Review.

9191

NEWTON BROTHERS (DERBY) LIMITED

require a

DRAUGHTSMAN

with experience of lightweight electrical rotating machines; permanent position with generous pension and life assurance schemes; post includes a modern house for selected candidate whose qualifications should equal H.N.C. standard.

Apply giving age, full particulars of training and experience and stating commencing salary required to Secretary, Newton Brothers (Derby) Ltd., Alfreton Road, Derby.

All applications will be treated in confidence and a grant toward removal expenses would be considered. 1198

NATIONAL COAL BOARD

SENIOR ELECTRICAL ENGINEER required by N.C.B.'s Central Engineering Establishment, Stanhope Bretby, near Burton-on-Trent, to be responsible to Section Head for the design and development of general electrical equipment, including motors, starters, contactors, plugs and sockets, cables, etc., used in the coal mining industry. Corporate membership of the I.E.E. or equivalent qualification is essential. Appointment (superannuable) according to qualifications and experience within salary range £1,250-£1,850.

Write stating age, education, qualifications and experience to National Coal Board, Staff Dept., Hobart House, London, S.W.1, marking envelope X/964F, before 15th November, 1957. 1128

CENTRAL ELECTRICITY AUTHORITY

South Western Division

SECOND ASSISTANT ENGINEER (Control) required in the System Operation Department.

Superannuation scheme. Salary N.J.B. Class AX/EX, Grade 2, £1,145-£1,270/£1,410 plus 10% for shift duties.

Previous experience in Grid Area control room duties essential. Duties primarily concerned with switching and plant load estimates.

Applications on form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Rd., Bristol, 8, should be completed and returned by 23rd November, 1957. 1191

CUMBERLAND COUNTY COUNCIL

County Architect's Department

APPLICATIONS are invited for the following appointment. N.J.C. service conditions, post pensionable, subject to medical examination. Commencing salary within Special Grade (£750 × £40 to £1,030) according to qualifications.

ASSISTANT ENGINEER (Electrical).

Applicants must be A.M.I.E.E. or Grad. I.E.E. Experience with schools and similar buildings electrical installations required.

Applications on forms obtainable from John H. Haughan, F.R.I.B.A., County Architect, 15, Portland Square, Carlisle, to be received by him not later than Friday, 15th November, 1957.

G. N. C. SWIFT,
Clerk of the County Council.

1037

TECHNICAL REPRESENTATIVE

required to sell electrical equipment to industry only, and not to wholesalers, in the West of England, Birmingham, North London areas.

If you have basic electrical knowledge, experience in selling in these areas, want a four-figure salary, firm car and expenses account, and a job with a rapidly expanding sales team that keeps in front, write to :—

Sales Manager,
OLIVER PELL CONTROL LTD.,
Cambridge Row,
Woolwich, London, S.E.18.

These positions have become available owing to promotion. If you are not already selling to industry and have no electrical background please do not apply. 1056

BOXALL ENGINEERING LIMITED

Khartoum, Sudan

DUE to the expanding activities of the company a QUALIFIED ELECTRICAL ENGINEER is now required for general duties in the power and utilisation field. Some sales and commercial experience will be an advantage, and preference will be given to candidates possessing a knowledge of Arabic.

Applications, together with brief details of training and experience, should be addressed in the first instance to the Company's London Agents, Messrs. Fendrake Limited, 20, Fenchurch Street, London, E.C.3, marked for the personal attention of Mr. H. R. Holland. 1028

A SENIOR ELECTRICAL ENGINEER

is required for the London office of a major oil company to handle design problems connected with thermal power plants of large capacity and their associated distribution networks.

Candidates, under forty years of age, must have had several years of similar experience since qualifying and be prepared to visit overseas installations from time to time.

Apply to—Box 1153.

COUNTY BOROUGH OF WEST HAM

EXPERIENCED ELECTRICIAN required. Must be familiar with electrical installations in public buildings, workshops and domestic premises, and must be capable of making adjustments, conducting installation tests, recording data, reporting on compliance with specifications by contractors, and any other work of similar character.

Wages £11 per week of 44 hours.

Applications to the Borough Engineer and Surveyor, West Ham Town Hall, Stratford, London, E.15, immediately. 1152

MURGATROYD'S SALT & CHEMICAL CO. LTD.

Elworth, Sandbach, Cheshire

require an

ELECTRICAL DRAUGHTSMAN

Applicants should hold at least the O.N.C. and be capable of undertaking, with minimum supervision, detailed layouts of substations, H.T. and L.T. networks, power and lighting schemes in connection with chemical plants.

The successful applicant will be eligible to join the company's staff pension scheme. Assistance given regarding housing. Applications to be addressed to works manager. 9187

Situations Vacant *(continued)*

LONDON ELECTRICITY BOARD

Engineering Draughtsman

APPLICATIONS are invited for the above position in the Kent Suburban District at Erith.

Applicants should have a good general education, must be neat and accurate draughtsmen and should preferably have had experience with an electricity supply authority in one of the following: electrical plant layout; elementary building construction; mains recording.

The post is graded under Schedule D of the National Joint Board agreement as Grade 6, £635-£755 per annum, inclusive of London allowance.

Applications to be made on forms obtainable by writing to Personnel Officer, 46, New Broad Street, London, E.C.2. Please quote ref. PER/2388/R. 1196

SOUTH WALES ELECTRICITY BOARD

PRINCIPAL ASSISTANT required in the Administrative Department of the Eastern Sub-Area of the Board at Newport.

Applicants should have extensive experience of general adminis.ration and secretarial work, and the possession of an appropriate qualification would be an advantage. A knowledge of personnel and establishment work, preferably in relation to the electricity supply industry, is also desirable.

Salary Grade 7 (£1,035/£1,125) of the N.J.C. (Administrative and Clerical Grades).

Applications stating age, present position and salary, qualifications, experience, and three referees, should be addressed to the Secretary (Establishments) Section), St. Mellons, Cardiff, so as to reach him not later than Monday, 18th November, 1957. 1166

SOUTH WALES ELECTRICITY BOARD

ASSISTANT ENGINEER (Construction) required at Pontardulais in the West Central Sub-Area of the Board.

Applicants should have had experience of fault location and commissioning of tests on mains and equipment.

Salary Class L, Grade 13 (£835/£880) of the N.J.B. Schedule.

Applications stating age, present position and salary, qualifications, experience, and three referees, should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, so as to reach him not later than Monday, 18th November, 1957. 1151

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

RECORDS DRAUGHTSMAN required in the North Wirral District at Birkenhead. Salary £500/£600 per annum (N.J.C. Grade 1).

Applicants should have had drawing office experience and be able to prepare, from information obtained on site, records of overhead lines, underground cables and substation layouts.

Applications, on forms obtainable from the Manager, No. 3 Sub-Area, Electricity House, Newgate Street, Chester, must be forwarded not later than 19th November, 1957. 1165

BRITISH KLOCKNER SWITCHGEAR LIMITED

Chertsey, Surrey

ESTIMATOR for TECHNICAL SALES Correspondence and capable of preparing control schemes involving automatic motor control gear. Experience essential.

CIRCUIT DIAGRAM DRAUGHTSMAN Preferably experienced in preparing automatic control gear schemes.

Applicants to have O.N.C. (Electrical) Excellent opportunities with fast growing concern. Pension scheme. Apply to Managing Director, stating experience and present salary 165

ASSISTANT chief electrical engineer required for mining company operating in Ghana. Experience should cover maintenance of all electrical plant appertaining to mining. Must be prepared to work underground. Basic salary £100 per month. Age not over 45 years. Continuous contracts, tours of 12/15 months with 3 months' leave on full pay. Free passage, accommodation and medical attention. Provident fund. Apply by letter stating full particulars of experience to—Box 6, Walter Skinner Ltd., 20, Copthall Avenue, London, E.C.2. 1171

ARMATURE winder chargehand to supervise winding department of expanding electric motor repair shop employing mixed labour. Good prospects.—Shoolbred Rewinds Limited, 1, Langley Street, Luton, Beds. 1029

ASSISTANT electrical engineer. The Morgan Crucible Company Limited invites applications from candidates in the 28/35 age group who hold a minimum qualification of O.N.C. in Electrical Engineering. The successful candidate will be appointed to the Central Engineering Department and should have had experience in the preparation of lighting and power schemes for factory and office premises, be able to prepare electrical drawings and develop intricate circuits for the automatic operation of plant, and be familiar with lift controls and electric motors. He should be fully conversant with I.E.E. regulations and B.S. specifications. His duties will involve the preparation of estimates and schemes, the drafting of specifications and the supervision of contractors. Appointment will be to the permanent superannuated staff. Benefits include a non-contributory life insurance, staff canteen and full social and sporting amenities. Please make written application in strict confidence to Staff Department, Battersea Church Road, London, S.W.11, and quote reference "Wes." 1172

ASSISTANT to managing director required by small manufacturing company. Minimum qualification O.N.C. Experience of small motors and control gear including inspection desirable. The post offers great opportunity to young man with drive and initiative. Write detailing qualifications, training, experience and salary required to—Poxon Engineering Ltd., 1, Northolt Road, Harrow. 9190

AUSTRALIA. In a new factory near Melbourne, now under construction, British Nylon Spinners (Australia) Pty. Ltd. will shortly begin the large-scale production of nylon yarn. This is a modern plant in which instrumentation will play an increasingly important part, and applications are invited from men with wide experience in this field for an appointment as instrument mechanic. For the right man there are considerable prospects. Experience is required over a wide variety of instruments falling into the following categories: (a) pneumatic controls; (b) thermo-electric temperature recording and control (in the low-temperature range); (c) mechanical instruments generally for testing and laboratory purposes; (d) electronic apparatus. This is a first-class opportunity for a man of approximately 30-40 years of age who plans to emigrate to Australia. The working conditions and terms of employment are in accordance with the progressive nature of the company. Applications should be sent in the first instance to the parent company, addressed to the Personnel Manager, British Nylon Spinners Ltd., Pontypool, Mon. Candidates invited for interview will be given the fullest information. 1068

BOOTS PURE DRUG Co. Ltd., require engineering draughtsmen for the preparation of electrical installation schemes and specifications, as required for retail shops. 5-day week, good canteen facilities, contributory superannuation scheme, 2 week's holiday with pay, increasing to 3 weeks. Applications in writing, giving experience and qualifications, to—Personnel Manager, Station Street, Nottingham. 1201

BUYER required by firm of electrical and mechanical engineers. Full particulars, including age, experience and salary required, to—Browning's Electric Co. Ltd., Boleyn Castle, Green Street, Upton Park, London, E.13. 1158

BUYER/stock controller wanted, accustomed to electrical contracting and light engineering trade. Accommodation available. Apply by letter. — Simpson Bros. (of Hapton) Ltd., Hapton, Nr. Burnley. 129

CABLE works, East London, have semi-clerical vacancies for young men with broad knowledge of cable manufacturing processes. Details age, positions held and present salary to—Box 9174.

CENTRAL ELECTRICITY AUTHORITY requires a fourth assistant engineer in the electrical department, transmission construction section, Longsight, Manchester. Salary £710-£835/£935. Applicants should preferably possess H.N.C.. Experience of high voltage transmission lines would be considered an advantage. Applications in writing quoting Vacancy No. E.42/441/R. should be forwarded to—Director of Labour and Welfare, Central Electricity House, 825, Wilmslow Road, Manchester, 20, before 13th November, 1957. 1202

CABLE jointers and mates required for employment in the London area. Must be good plumbers and experienced in voltages up to 11 kV, also live L.V. work.—Box 1173.

CABLE manufacturers require an assistant test engineer with sound electrical training. Testing experience desirable but not essential as training would be given. Age over 20. Good working conditions and canteen facilities. Apply —Britannic Cables Ltd., Iver, Bucks. 1073

CIRCUIT design draughtsmen required by company manufacturing industrial control equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road. Hounslow, Middx. 273

COMMERCIAL engineer required for electrical contracting, Manchester area. Must have good connections with architects, consulting engineers, etc. Apply to—B. French Ltd., Pike Mills, Green Street, Kidderminster. 1121

CONSULTING engineers require electrical designer draughtsman experienced in all classes of lighting and power installation for hospitals, schools, industrial projects, preparation of contract documents, specifications, etc. Good salary and bonus. Preference to Graduate or Associate Member of Institution of Electrical Engineers. Reply to—A. F. Myers & Partners, 147, Victoria Street, London, S.W.1. 871

CONTRACTS engineer required for the installation and jointing of power cables, control of rough labour, and keeping as laid drawings on contracts in London and elsewhere. Must be prepared to travel. Good salary and conditions. Permanent employment.—Box 1134.

DESIGNER draughtsman, leading firm of contractors London, has a senior appointment of wide scope and interest available to a first-class engineer able to design (and supervise site work) high-class electrical installations of all types. Good junior also required. Excellent prospects and salary. Write, experience, age and salary envisaged.—Box 1203.

DEWHURST & PARTNER Ltd. require technical estimator for preparing tenders in their estimating engineering department. Applicant must have good electrical engineering background and have basic knowledge of motor control equipment and its applications. The position is a senior one, and housing assistance will be given to successful applicant if necessary. Canteen facilities, pension scheme. Write giving age, experience, etc., to — Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middlesex. 274

ELECTRICAL draughtsman. National Certificate standard or equivalent in electrical engineering. Experienced in electrical switchgear and distribution diagrams, automatic contactor switchgear for motor control. Previous paper mill experience preferred. Apply in writing giving details of age, training and experience to—Bowaters United Kingdom Pulp and Paper Mills Limited, Thames Division, Northfleet, Kent. 1123

ELECTRICAL engineer/draughtsman with knowledge of complete electrical installations for coal and coke handling plants. Experience of both contract and estimating desirable. Pension fund and canteen facilities. Apply giving full particulars of experience and technical qualifications, salary, to Messrs. W. J. Jenkins & Co. Ltd., Retford, Notts. 956

ELECTRICAL engineering draughtsman required with some experience in the preparation of schemes for M.V. electrical distribution and illumination and electrical equipment of industrial buildings. Minimum technical qualification O.N.C. Conditions include a contributory pension scheme, family education schemes, and a wide variety of recreational facilities, etc. Apply, stating age, qualifications and experience, to the Personnel Officer, Pilkington Brothers Limited, Cowley Hill Works, St. Helens, Lancashire. 1075

ELECTRICAL instrument engineer required by Mullard Research Laboratories in the Measuring Instrument Division. Applicants must have had previous experience in the calibration and standardisation of all types of electrical indicating instruments. Some mechanical ability would be an advantage. Permanent pensionable post. Excellent working conditions. Apply in writing to G. A. Taylor, Personnel Officer, Mullard Research Laboratories, Cross Oak Lane, Salfords, near Redhill, Surrey, quoting ref. DP. 1176

ELECTRICAL engineer required for London firm of consulting engineers. Previous experience in the design and specification of installations in schools, hospitals, etc., desirable but not essential. Write stating age, salary required and brief details of qualifications and experience to—Box 864.

ELECTRICAL or mechanical engineer wanted by large Germany company for German-English translations. Applications are invited from British-trained engineers with a good knowledge of German who have an inclination towards translation work and desire to work in a good environment in Germany for at least 2/3 years. Write stating age, education, experience, salary required, to—Box 1154.

ELECTRICAL service manager required to provide overall control and supervision of the servicing organisation associated with the retail branches of a large trading concern in Nigeria. A good technical knowledge of radio and domestic appliances required coupled with experience in workshop practice, the training of mechanics and a flair for administration. Commencing salary will depend on qualifications and experience, but will not be less than £1,300 per annum, and there are good prospects for advancement. Free furnished accommodation and medical attention provided in Africa. There is a contributory pension fund and income tax is low. Tours in West Africa would be about 21 months and would each be followed by approximately four months' leave on full pay. Generous family allowances; free first class passages provided. Apply giving full particulars to—Box 1063.

ELECTRICAL surveyor required by leading insurance company for Leeds district. Apprenticeship and shop experience in the manufacture or repair of electric motors necessary and drawing office experience an advantage. Technical training to Higher National standard. Age 26-32. Commencing salary £735 rising to £1,060. Non-contributory pension scheme and other staff benefits. Write—Box 977, Walter Skinner Ltd., 20, Copthall Avenue, London, E.C.2. 1155

ELECTRO-mechanical draughtsmen required for production drawing office of company engaged in the manufacture of control gear equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middx. 275

ENGINEERS, assistant engineers and technical assistants required for electrical, mechanical and commercial engineering associated with the planning and execution of railway signalling projects in the U.K. and British Commonwealth. Excellent prospects for those interested in light current engineering, electronic and relay circuiting, and analysis of railway operating problems from technical or commercial aspects. The positions are pensionable after satisfactory probationary period. Location London or Manchester. Salary according to age, qualifications and experience. Applicants should state their age, educational qualifications and technical experience. Applications should be sent to the Manager, Metropolitan-Vickers G.R.S. Limited, 132/135, Long Acre, London, W.C.2. 1174

EXPERIENCED draughtsman required for interesting contract work. Electrical knowledge essential. Good conditions and prospects. Pensionable staff appointment. Please apply in writing to Personnel Manager, Ferguson Pailin Ltd., Higher Openshaw, Manchester, 11. 1175

GENERATOR manufacturers require sales engineer, previous sales experience not essential, however, applicants should be capable of discussing generating sets up to 750 kVA. Residence in London area preferred. Confidential application with full details and salary required to—Box 1079.

INSPECTING engineer (electrical) required in Manchester by consulting engineers to assist with inspection and testing supervision of control gear and other light electrical equipment, including instrumentation, metering, communications and electronics as applied to thermal, nuclear and hydro-electric generating stations and transmission systems. Applicants must possess appropriate I.E.E. or other equivalent qualifications, and salary and prospects will be commensurate with the character of the appointment. Application forms should be applied for in writing to "Staff Appointments." Kennedy & Donkin, 813a, Wilmslow Road, Didsbury, Manchester, 20. 1136

ELECTRICAL wholesaler requires young man for warehouse duties, capable of taking telephone orders and making up of goods. Contracting trade, no radio or T.V. Croydon area. Non-contributory pension.—Box 1135.

ELECTRICAL wholesalers S.E. London area require three male staff, age 23 to 30, as sales invoice, purchase invoice and order clerks. —Box 1204.

INSTRUMENT mechanic with good electrical knowledge for the maintenance of industrial meters covering boiler and power plant and paper manufacture.—Bowaters United Kingdom Pulp and Paper Mills Limited, Thames Division, Northfleet, Kent. 1122

JUNIOR draughtsman, electrical, with experience in switchboard and fusegear design. Top rate and bonus (superannuation after twenty-five years of age). Apply giving full experience and particulars to—Artic Fuse & Electrical Manufacturing Company Limited, Birtley, Co. Durham. 1205

JUNIOR electrical engineer/draughtsman. Age 22/25. H.N.C. or O.N.C., experienced in estimating and contract work for mechanical handling plant. Pension fund, sports and canteen facilities. Particulars of experience, qualifications and salary to—W. J. Jenkins & Co., Retford, Notts. 1137

LONDON consulting engineers opening offices in Croydon require senior and junior engineers and draughtsmen for the design of electrical installations for buildings at home and abroad. Salary according to qualifications and experience. Write—Barlow, Leslie & Coombes, 5, Catherine Place, London, S.W.1. 1138

OVERHEAD linesman required by the Central Electricity Authority at Staythorpe Transmission Section. The work includes the overhaul and maintenance of existing 132,000-volt lines, and experience on 275,000-volt lines will be an advantage. Previous experience of H.V. steel tower lines an advantage. Rate of pay 4s. 7½d. per hour, 44-hour week. Terms and conditions of service in accordance with the National Joint Industrial Council Agreement. Applications in writing, stating age and experience, to Divisional Establishments Officer, Central Electricity Authority, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham. Please quote Vacancy No. 197/57/ER. 1170

QUALIFIED electrical engineer required for hydro-electric power undertaking in Northern Nigeria, 4,000 feet above sea level, pleasant climate. Comfortable furnished quarters provided, first class passages for self, wife and two children or equivalent benefits if children remain at home. Good salary and pension scheme with liberal leave after 18 months' tour. Write, stating age, full qualifications and experience, to — Box Z.264, c/o Streets, 110, Old Broad Street, London, E.C.2. 1106

REPRESENTATIVES required for all areas, with established connections with leading retailers and stores in the electrical domestic appliance trade, to market a range of nationally advertised electrical domestic appliances. Own car essential. Salary, expenses and commission. Only men possessing initiative, drive and ambition for promotion, and aiming to earn from £1,500 p.a. upwards, need apply to—Box 1025.

SALES manager required by firm of electrical and mechanical engineers manufacturing a wide range of special products. Full particulars, including age, experience and salary required, to — Browning's Electric Co. Ltd., Boleyn Castle, Green Street, Upton Park, London, E.13. 1159

SALES representative (age 25/30 years) with electrical engineering background required by old-established electrical engineering company in North-West London, to train as sales representative. Superannuation scheme. Write giving full details of age, experience and salary required to—Box 3 M.G.9344, A.K. Advg., 212a, Shaftesbury Ave., London, W.C.2. 975

SENIOR sales engineer to operate from London office of leading manufacturer of rotating electrical machinery. Highest technical and commercial qualifications are required. Prospects of promotion to branch manager for suitable applicant. Pension scheme and car provided. Reply in confidence stating age, experience, qualifications and salary required.—Box 1107.

TRANSFORMER draughtsman required for detail work on all types of distribution transformers. Applications giving age, education, experience, etc., to the Personnel Manager, South Wales Switchgear Ltd., Blackwood, Mon. 976

TRANSFORMER designer (senior) required. Applicant must have wide experience in design and manufacture of units up to 250 kVA. Promotion to directorship offered after qualifying period with commensurate salary and bonus. Housing accommodation if required. Replies will be treated in strict confidence.—Stewart Transformers Ltd., 75, Kilburn Lane, London, W.10. 1108

WELL-known C.M.A. cable manufacturer, located in the North-West, requires a sales engineer to develop business in plastic cables, with particular reference to aircraft, electronic and communication industries. Please apply in strict confidence, giving fullest details, to—Box 1160.

WELL-known cable manufacturer (C.M.A.) requires sales representative for the London area. Applicants should be between 25-40 years, preferably with established connection. The position offers good prospects for advancement and applicants should write in confidence to—Box 1206.

YOUNG assistant to electrical engineer required. Must be experienced in hotel or domestic wiring installations and capable of preparing specifications and plans. Interesting work for man willing to travel. Superannuation scheme. Reply giving age and full details of experience to—Deputy General Manager, Trust Houses Ltd., 53, Short's Gardens, London, W.C.2. 1139

YOUNG electrical engineer required for training as assistant designer on special motors and other electrical equipment. Full particulars, including age, technical qualifications and salary required, to—Browning's Electric Co. Ltd., Boleyn Castle, Green Street, Upton Park, London, E.13. 1157

YOUNG man required with good background in electrical engineering to train as representative to call on firms in U.K. in connection with control instruments for industrial applications and automation. Full details and salary required to—Box 1156.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

ADAPT. foreman, single (30), supp. co. apprent. const., maint., power station, refinery, chemical, indust., domestic, marine installations, o.h., u.g., dist., gen. admin., wants further overseas tours.—Box 9167.

ADVERTISER, 10 years managerial/resident engineer capacity, controlling major electrification contracts, o/h lines, etc., home and overseas, desires similar or allied appointment. Currently assistant to managing director substantial manufacturing company, machining, tooling, steel fabrications. Age 38. Experienced general management, including budgetary control and costing, company finance.—Box 9182.

AN electrical engineer, H.N.C. (34), seeks permanent position London. Experienced sales, tendering and contracts.—Box 9172.

CHIEF chemist, fully qualified, middle forties, seeks change to company where specialist knowledge of insulating materials, including varnishes, wire enamels, resins and plastics, will be of value. Salary required £1,400 per annum.—Box 9176.

ELECTRICAL engineer with own car, having long practical experience in motor and generator repair trade, desires engagement with business concern wherein experience and knowledge can be used to advantage. Resident Surrey.—Box 9188.

ARTICLES FOR SALE

WELDING SETS

SPOT Welders by SCIAKI, 25 and 15 kVA; air operated with automatic timers; 400/440 v., 50 cycles.

New OXFORD oil-cooled Transformer Arc Welding Sets, 300, 250 and 160-amp. capacity; 400/440 or 230/250 volts A.C.

GEORGE COHEN SONS & CO. LTD.
Wood Lane, London, W.12
(Tel. Shepherds Bush 2070) and
Stanningley, Nr. Leeds
(Tel. Pudsey 2241) 206

***Articles for Sale** (continued)*

ELECTRIC MOTORS FOR SALE
3-phase, 50 cycles

No.	H.P.	Make.	Type.	R.P.M.
1	75	ENG. ELEC.	SC	1465
1	32.5	CROM. PARK.	SCTE	2940
1	30	CROM. PARK.	SCTE	965
1	15	STERLING	SCTE	1500
		Each complete with Star-Delta Starter.		
1	70	STERLING	SCTE	1500
1	70	ELECTRA	SCTE	1500
		Both vertical complete with starters.		
1	90	CROM. PARK.	SR	580
		With Auto Stator/Rotor Starter.		
2	7.5	STERLING	SCTE	38/18
2	3	STERLING	SCTE	28/ 9
1	.75	STERLING	SCTE	65/22
		Above variable speed.		
1	75	FAIRBANKS MORSE	SCTE	1475
1	60	WARD BROS.	SR	1463
1	25	STERLING	SCTE	1500
2	5	STERLING	SCTE	158
3	2	STERLING	SCTE	292
1	1.5	STERLING	SCTE	233
2	.75	STERLING	SCTE	292
1	.5	NEWMAN	SCTE	1500
2	.5	ELECTRA	SCTE	1500

HULL FISH MEAL & OIL CO. LTD.
St. Andrew's Dock, Hull
1161

COMPRESSOR SETS FOR SALE

MODERN UNUSED 12-c.f.m., 200-p.s.i. w.p., fully automatic, receiver-mounted Compressor Sets by CURTIS / BROOK MOTORS.

GEORGE COHEN SONS & CO. LTD.
Wood Lane, London, W.12
(Tel. Shepherds Bush 2070) and
Stanningley, Nr. Leeds
(Tel. Pudsey 2241). 1177

ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., s/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.

ALBERICE METER COMPANY
Fairfax Works, Fairfax Rd., London, N.8
(Tel. MOUntview 7944, 6373) 191

ABABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler: also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- Slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS from ½ to 675kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS, generators, 1-100 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

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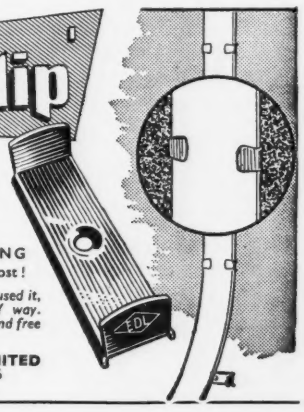

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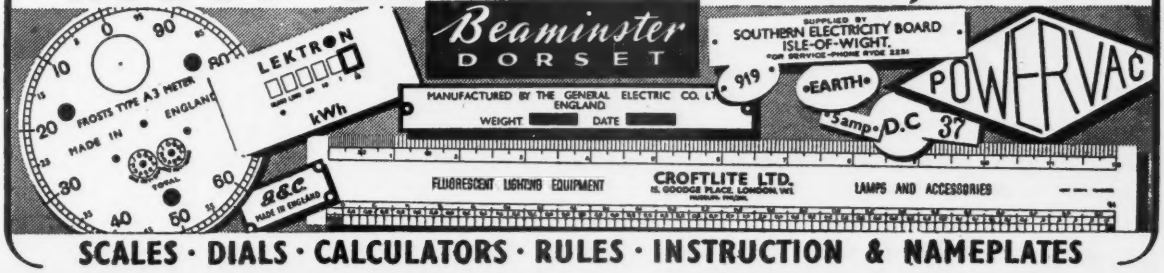

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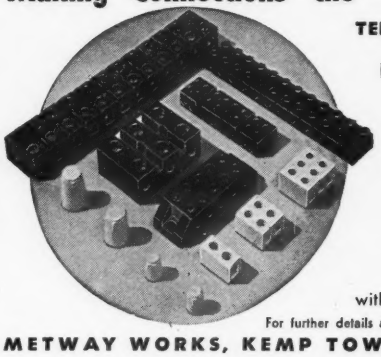

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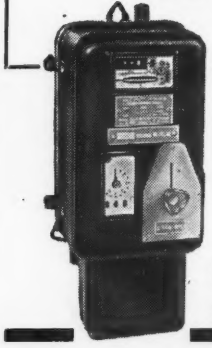

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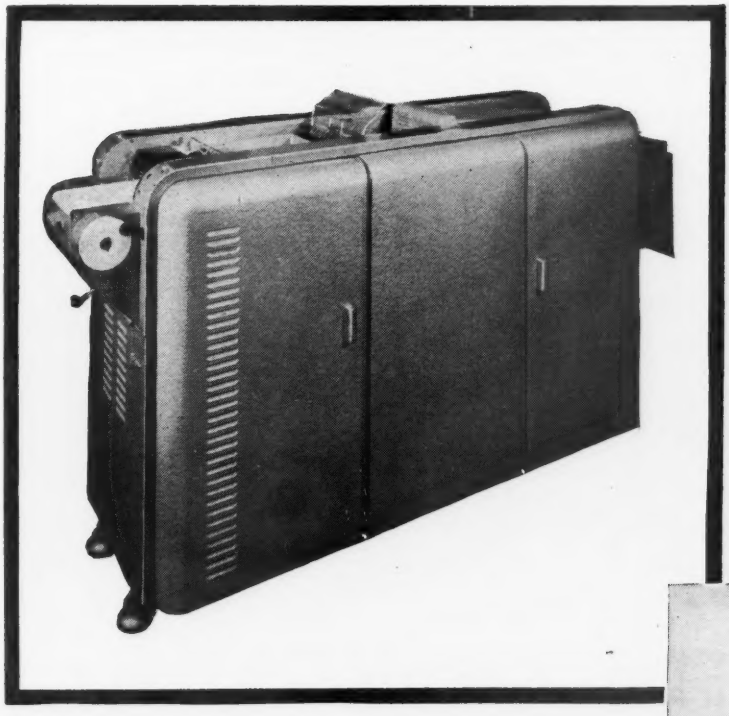

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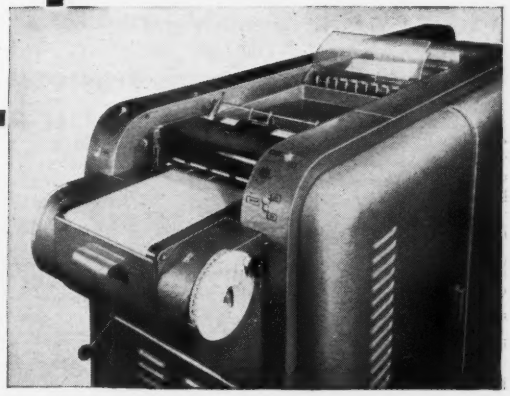

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Marine Whistle — *In lieu of steam or air whistle in ships.*

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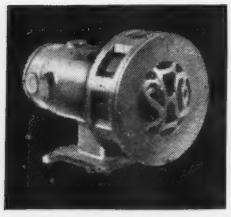
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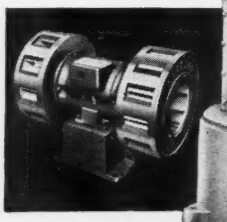
GENERAL PURPOSE 4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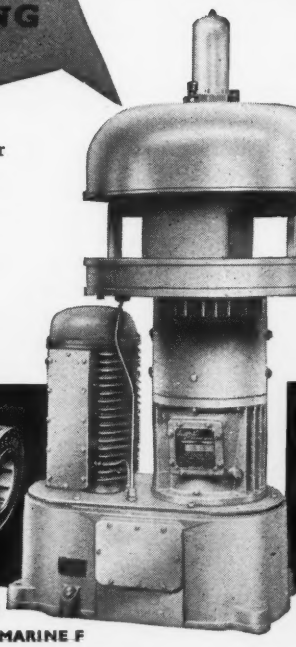
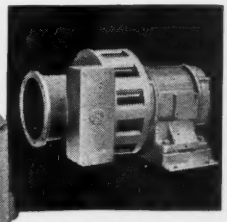

MARINE F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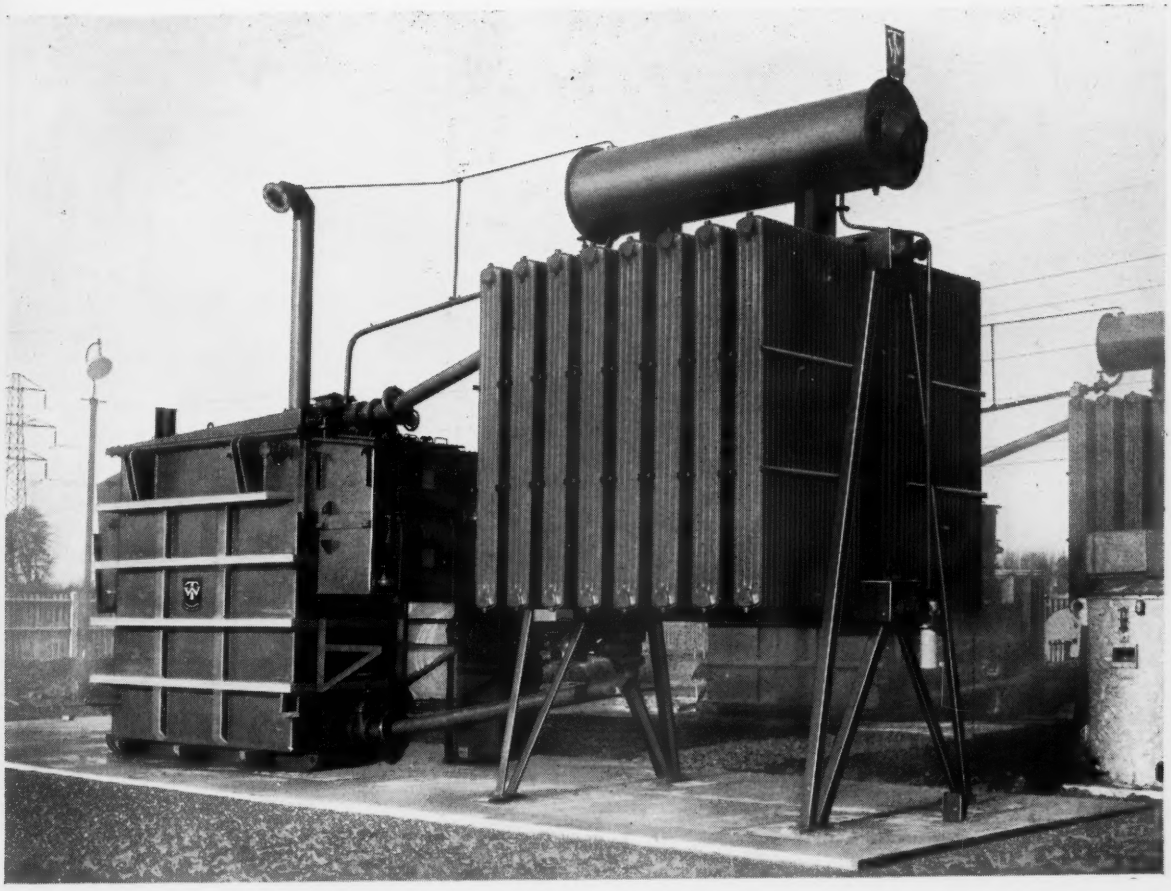

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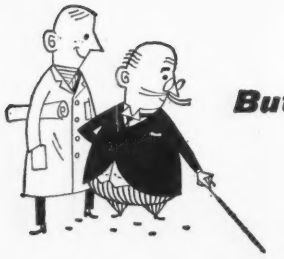

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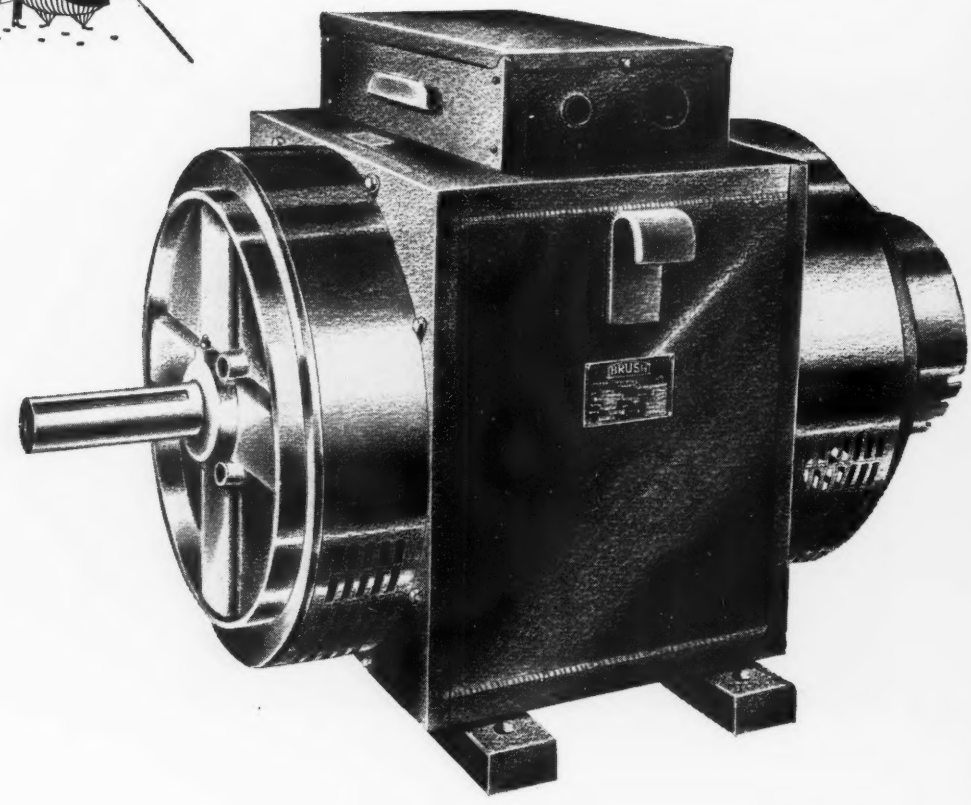

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